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THE GAS JOURNAL

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A Glance at the Contents—

Fuel Research Board.

The Department of Scientific and Industrial Research have published the Report of the Fuel Research Board for the year ended March 31, 1930, together with a Report by the Director of Fuel Research, Dr. C. H. Lander. A notice of this appears in the "JOURNAL" to-day.

Institution of Mechanical Engineers.

An account appears of the inaugural meeting of the Southern Branch of the Institution of Mechanical Engineers, which took place at Portsmouth on Jan. 8. Among the members of the Committee are Mr. T. Carmichael, Engineer and General Manager of the Portsmouth Gas Company, and Mr. Walter T. Dunn.

Water Heating by Gas.

An extract is given from the latest report of the American Gas Association Committee on Water Heating. Mr. H. E. Dexter, of the Central Hudson Gas and Electric Corporation, deals with "Economic Facts in Sales Promotion," while the question of automatic water heaters is considered by Mr. M. M. Scott, of the Ruud Manufacturing Company.

Gas Meter Making in New Zealand.

Newspapers recently to hand from New Zealand state that a new industry—the manufacture of meters—has been launched in Christchurch. On Nov. 21 last complimentary references to the initiative of the Company responsible, Messrs. Alder & Mackay, Ltd., were passed at a luncheon in their honour, which was attended by many representatives of the gas industry.

Oxide Purification.

One of the points emphasized by Mr. J. Dreverman, of Sydney, in a paper on Oxide Purification before the Australian Gas Institute, is the need for removing tar fog from the gas before it reaches the oxide boxes, if oxide purifiers are to be employed to the best advantage; and to this end a Lodge-Cottrell electrostatic precipitator having a capacity to treat 8 million c.ft. of carburetted gas per day has been erected at the Mortlake Gas-Works. We publish to-day a lengthy extract from his paper.

Parliamentary Bills for 1931 Session.

To-day we give the main provisions relating to gas in the following Parliamentary Bills: Lowestoft Water and Gas Company, Royston and Brodsworth Gas, Sheffield Gas Company, and South Yorkshire Gas Network.

London Juniors at East Greenwich.

On Saturday last the London and Southern District Junior Gas Association visited the East Greenwich Works of the South Metropolitan Gas Company. These works are the largest of the Company, and occupy an area of approximately 150 acres. Straight coal gas only is manufactured, and the declared calorific value is 560 B.Th.U. Three-quarters of a million tons of Durham and Northumberland coal is carbonized annually.

Distant Pressure Control.

Mr. H. C. Widlake gives a detailed description of his system of distant pressure indication, recording, and automatic control. He observes that the indicator service of an instrument situated three miles from the works can be had at an all-in cost of 12s. a week. Efficient distributing arrangements and good salesmanship have never played so great a part in the development of the gas industry as they do to-day, and the modern conditions which have to be met render it essential that the control of district pressures shall be regarded in the light of an exact science. Mr. Widlake's description formed the subject of a paper to the Western Junior Gas Association on Saturday last.

New Type of Rubber Tubing.

The Research and Training Section of the Gas Light and Coke Company were exhibitors at the Exhibition of the Physical Society and the Optical Society at the Imperial College of Science and Technology, South Kensington, on Jan. 6, 7, and 8. Examples were to be seen of a new type of rubber tube, the supply of gas passing through which cannot be interrupted. This eliminates any risk should someone happen to tread on the tube or do anything else that might normally be expected to stop the flow of gas. The principle of this interesting exhibit, which is shortly going to be adopted generally, it is understood, by the Gas Light and Coke Company, embraces a small metal core passing through the centre of the tube, with the result that, should the tube be stepped upon, this core will prevent its being completely flattened.

EDITORIAL NOTES

Distant Pressure Control.

AN acknowledged authority on the subject, Mr. H. C. Widlake, gives in our columns to-day a full account of the system of distant pressure control of which he is inventor, manufacturer, and user. There are, of course, many of our readers who are conversant—some as actual users—with the Widlake method; but there must be others among the junior ranks of the gas industry who will gain immensely by studying Mr. Widlake's remarks, which were addressed to the Western Junior Gas Association on Saturday last. There can be no two opinions in regard to the author's assertion that efficient distributing arrangements and good salesmanship have never played so great a part in the development of the gas industry as they do to-day, and the modern conditions which have to be met render it essential that the control of district pressures shall be regarded in the light of an exact science.

Distribution to-day, with its aim of satisfaction to the consumer, demands adequate pressure in every district at all times, whether by day or by night; and in many circumstances this demand cannot be met by ordinary methods of communication from district to works, for the information afforded by such methods comes to hand too late to avoid dissatisfaction. In Mr. Widlake's words, "So far as accurate and immediate information is concerned the existing methods are utterly useless, and when any irregularity does occur, the first intimation the works receive usually takes the form of the presence on the telephone of irate consumers." On the other hand, a distant pressure indicator furnishes at the works a continuous indication of the pressure prevailing at a selected point on the district, perhaps some miles away. There is no time lag between an alteration in pressure at that point and the intimation of the alteration at the works end. If, for instance, a pressure attendant chooses to glance at his dial a thousand times during his shift he would receive a thousand pressure reports. In other words, the instrument synchronizes the desire for information with the information itself. Among the advantages of the system quoted by the author are, first, that disputes between the works and the distribution staffs on the subject of district pressures are no longer possible; and, secondly, that where boosters or compressors are used considerable saving in power costs is effected, as such units of plant need only be used when required, and to the extent actually required. Unnecessary power charges, "to be on the safe side," have no *raison d'être*.

The author describes in detail his own apparatus for indicating and recording distant pressures, and also for automatic pressure control. He shows how foolproof this apparatus is, and how easy it is to maintain it in efficient working order. Actually an experiment of deliberate neglect was tried on one of his instruments, and it was found that it would work for about four months before there was loss of accuracy. And the indicator service of an instrument situated three miles from the works can be had at an all-in cost of 12s. a week—a small enough sum to keep the works staff continually informed as to the pressure conditions prevailing at the three-mile distant point. Among the incidental advantages of the Widlake apparatus, the designer emphasizes that distant pressure indicators can be scaled to meet any requirements. "The standard instrument can be fitted with a maximum number of forty contact points, corresponding to forty divisions on the meter scale, and it is a matter of complete indifference, as regards both the manufacture and the working of the instrument, whether the required number of divisions are uniform or vary in degrees of fineness."

Discussion of distant pressure control has added interest at the present time in view of amalgamations and absorptions of undertakings, which often result in the transformation of small gas-making plants into holder stations. We need not stress the advantages of distant control in such circumstances. The whole subject is of sufficient importance to merit the closest consideration; and we cannot do better than conclude this note by endorsing the following observations of Mr. Widlake: In modern gas distribution "we are dependent to an ever-increasing extent on power driven plant in order to effect delivery to our consumers, and unless this plant is scientifically controlled there is a danger of power charges featuring too largely in the costs of distribution, to say nothing of the risk to which undue reliance upon the individual judgment of operatives always gives birth. To many engineers, happy in the control of a favourably situated works in a well-balanced district, distant control apparatus may appear complicated and unnecessary, but it has been evolved in response to a definite demand, it is widely used, and is childishly simple by comparison with the methods which the natural growth of the industry will eventually render necessary."

Rating and Bulk Supplies.

IN view of the increasing amount of interest taken in the question of bulk supplies of gas, and having regard to the proposals for the central manufacture and distribution of gas in certain areas, it may be of interest to refer briefly to the case of the *Lord Mayor of the City of Manchester v. Bolton Area Assessment Committee and Council of the Urban District of Westhoughton* which was heard in December by Justices Avory, Swift, and Acton in the King's Bench Division.

The case took the form of an appeal from the ruling of the Recorder of the Borough of Bolton at Quarter Sessions. Evidence was given that, in pursuance of powers in a Special Act of Parliament, the Manchester Corporation entered into agreement with the Urban District Council of Atherton in 1907 for the supply of water in bulk to the latter Authority on terms therein set out; it being agreed that supplies should be recorded by a meter which was installed at the expense of the Urban District Council. It was further agreed that the supplies should be taken from the aqueduct of the Corporation (which conveyed water from Lake Thirlmere to Manchester and passed through the areas of various local authorities, including that of the Westhoughton Urban District Council) at a specific point.

The Recorder found as a fact that the Manchester Corporation was in occupation of the outlet from the aqueduct, and of the pipe connecting the main to the meter, as well as of the meter; that the portion of the aqueduct whence supplies were taken had an additional receipt bearing propensity; and that a hypothetical tenant would pay more for such portion than he would for a portion which was not directly productive. For these reasons he held that the Council of the Urban District of Westhoughton were entitled to a higher ratable value, having regard to the additional value given to that part from which bulk supplies were taken by the Atherton Urban District Council.

The Appellants and the Respondents were in agreement that the valuation of the Manchester Corporation Water-Works ought to be made in accordance with the method approved by the House of Lords in *Kingston Union Assessment Committee v. Metropolitan Water Board* (1926), but the Appellants contended that as the aqueduct was already rated as indirectly productive the question as to the rateable occupation of the main and water was irrelevant, and that the Courts had decided in earlier cases that a portion of an undertaking cannot be both directly and indirectly productive.

Mr. Justice Avory expressed his considered opinion that

a portion of the works which has been assessed in a particular parish as indirectly productive cannot be at the same time further assessed at an additional sum as directly productive—for the reason that, to permit this, would produce that very injustice which the "profits" principle was designed to prevent; under the mixed method suggested by the Respondents the Court could not protect the occupier from being rated beyond the rateable value of the whole undertaking. That the Court was bound to do so was laid down by Mr. Justice Wightman in *R. v. West Middlesex Water-Works* (1859). Justices Swift and Acton concurred, and the appeal of the Manchester Corporation was allowed with costs, but leave was given to appeal.

Unless and until this decision is reversed, therefore, the fact that bulk supplies may be taken from a main traversing the area of a local authority to supply another authority does not render that portion of the main both directly and indirectly productive, and no addition can be made to the apportionment for the area to represent any additional value accruing thereto by virtue of such diversion of supplies. There is nothing in the judgment to suggest that this ruling would not apply in similar circumstances to gas undertakings "tapping" their mains in a particular district away from the works for the purpose of supplying gas in bulk to neighbouring company or municipally owned undertakings. For this reason it is thought our readers will be interested in the case.

Oxide Purification.

One of the points emphasized by Mr. J. Dreverman, of Sydney, in a paper on Oxide Purification before the Australian Gas Institute is the need for removing tar fog from the gas before it reaches the oxide boxes, if oxide purifiers are to be employed to the best advantage; and to this end a Lodge-Cottrell electrostatic precipitator having a capacity to treat 8 million c.ft. of carburetted gas per day has been erected at the Mortlake Gas-Works. It is considered that "with this installation, which operates efficiently at a temperature of 100° Fahr., the tar fog content, which often reaches 300 grains per 100 c.ft. of gas on the inlet of the purifiers, will be reduced to less than 10 grains. This result must considerably affect the economical working capacity of the purifier boxes, and probably indicates that under our climatic conditions the volume of oxide required per 1000 c.ft. of gas treated may reasonably be reduced to about 4 c.ft., or less than half that generally recommended."

The author considers at length the selection of suitable oxide—selection which must depend on the activity and capacity of the material and its physical characteristics. Many of his observations are not new, but they are well worth bearing in mind; and the results of a careful investigation of several types of natural and artificial oxides will be studied with keen interest in this country as well as in Australia, where the conditions as regards both the sulphur content of the gas and the temperatures at which the purification process is operated differ markedly from those in England. The same general principles apply, however. For example, it is only recently that suppliers of oxide have rid themselves of the iron-content idea of the worth of purifying material. Tests made not long ago at Mortlake demonstrated that the suppliers, under the impression that the higher iron concentration oxides were the better for the absorption of sulphuretted hydrogen, were actually supplying an inferior quality. Chemical analysis of an oxide is not alone a criterion of its virtues. Its physical state is of primary importance, for on its fineness depends the surface offered to the gas, and upon its retention of an open structure depends the back pressure thrown. Following the investigation into the selection of the most suitable oxide, a specification for natural oxide, indicating the iron content, loss of ignition, and fineness, was adopted, and it is on this basis that supplies at Mortlake have since been obtained.

Mr. Dreverman's account loses a great deal by the absence of any cost figures, and his comparative table relating to various types of oxide shows the artificial oxide to disadvantage in that the particular sample tested is an inferior one. He states that the economic value of an oxide on a gas-works depends upon the quantity of impurity it will remove from the gas relative to its cost; and in some districts it is more economical, on account of freights amounting to 2 to 3 times the initial value of the better material, to use an inferior local one. He hardly lays sufficient stress on the fact that low initial cost of oxide may have only a small incidence on the total cost of purification. He does, however, very rightly emphasize the great importance of properly preparing the oxide mixtures before they are placed in the boxes. In regard to the Mortlake purifier boxes holding 4000 c.ft. of oxide, he remarks that, if filled with an unsuitable mixture, a box of this size may hold 160 to 170 tons of oxide and remove only 10 to 20 tons of impurity before it must be taken out on account of back pressure; while with improved mixtures of a more practical density it will be necessary to handle only 120 tons to remove over 100 tons of impurity by the same box per fouling. The author is a strong advocate of the use of soft-wood sawdust as a lightening material, and he does not favour the employment of admixtures of new and spent oxide. He does not mention admixtures of natural and artificial oxides, which, we suggest, often prove a sound, practical, and economic proposition, and get rid of the obvious disadvantage of wasting purifier space by inserting an inert material.

High-Handedness.

The gas industry, as was pointed out in the course of an interview reported in the "Daily Express" last week, has a legitimate grievance in the "high-handed attitude of many local authorities who have built houses with public funds. The tenants are often compelled to use electricity for both lighting and cooking, whether they like it or not." Obviously "the councils are doing this because they own the electricity supply," and, as the pages of the "Journal" show, it "is going on all over the country." So that there is every excuse for the feeling of the gas industry "that it is time it was stopped." Quite recently a letter was published in the "Star" (and reproduced in our last issue), protesting against this "victimization" of council house tenants; and there has been correspondence on the same subject in the "South London Press." One writer in the latter paper remarks that "gas companies and their workers must be ready to meet all legitimate competition, but they should not have the dice loaded against them." This seems fairly to sum up the situation.

In our Review of 1930, several matters were pointed out which should not be lost sight of, and this was one of them. There are sufficient legislative restrictions on our liberties, without the exercise by certain municipal authorities over their tenants of what has been termed "a new and impudent form of dictatorship," and the gas industry must lose no opportunity of protesting against a course which is unfair both to those who live in council houses and to itself. Though only a portion of the total number of gas undertakings may as yet be directly affected by efforts of municipal authorities to force their own electricity supply upon tenants of council houses, tendencies of this kind have a way of growing, and it is easier to stem the rivulet than the river.

In addition to agitations that have taken place in the London district, the case of Barnsley will be still fresh in the minds of readers; and after that we had occasion to draw attention to the fact that the Town Councils of Dover and Wrexham were also manifesting "a similar hostile attitude towards the installation of gas in new housing estates." Still more recently there has been the case of Bath, where, in spite of the recommendation of the Housing Committee that the offer of the Gas Company should be accepted for an all-gas supply, the City Council agreed by a large majority to utilize gas for cooking and heating and electricity for lighting, though the estimated cost of installing fittings, &c., for an all-gas supply was £3776, for an all-electric supply £9288, and for electricity for lighting and gas for heating and cooking £6281. One of the arguments introduced on that occa-

sion was that, if the tenants were very poor, they were just the people who ought to have electric lighting, because of the smallness of their rooms, and because "if they could not afford the difference between the cost of electric light and gas, they could not afford to heat their rooms properly, and therefore would not have ventilation." Usually, such heat as results from gas lighting is regarded as a great point in favour of that method of illumination for working-class dwellings, as "between seasons" it frequently does away with the need for a fire.

The Water Heating Load.

HOWEVER sure we may feel about our knowledge of the advantages of water heating by gas, and of the various methods of encouraging a load which is one of the most valuable the gas industry can have, it is always well to pause occasionally and review this knowledge. For this reason—though there is nothing startlingly new about the contributions—we suggest that time spent in reading what Mr. H. E. Dexter and Mr. M. M. Scott have to say on the subject in this issue of the "JOURNAL" will not by any means be time wasted. As a result, perhaps not a few will be led to share our belief that some of the major advantages of gas for water heating are apt to be overlooked in sales talk, or at any rate to be given insufficient emphasis. Reliability, cleanliness, saving of labour, and of valuable space which would otherwise (except in the case of electricity) be occupied by fuel—these points in favour of gas immediately spring to the mind; but there are others which are not stressed so often as their importance merits. Among these is the fact that gas is essentially a safe form of water heating when the appliance is properly fitted; modern automatic water heaters are equipped with thermostats and safety devices which render the whole water-heating installation of the home, office, or factory foolproof. Then there is the fact that most gas water heaters have a rapid recovery, which reduces the size of the storage tank to a capacity just large enough to take care of the largest single demand. Again, because of controlled temperatures, no strains are put on storage and piping systems; liming or scaling is not produced, and a longer life of the system is obtained.

These are among the points dealt with by Mr. Dexter; and both he and Mr. Scott emphasize that salesmen who go out after the water heating business should know all about them. The salesmen themselves should be of a "high type," which implies a good rate of compensation. "This compensation," says Mr. Dexter, "should be such that the superior type of selling man will be able to earn as much or more by his efforts in selling continuous water heating service than he could earn by the same amount of effort expended in any other field." In America to-day the general tendency is towards a higher rate of pay for sales of what are termed "load building appliances;" and the gas water heater is definitely a load builder. To cultivate efficiency among the salesmen, Mr. Scott speaks, among other things, of the value of model sales interviews, where one salesman takes the part of a customer and another that of a gas salesman. This idea has much to commend it, as has already been demonstrated in this country; and the practice might well be extended. Then there is the organization of all employees of a gas undertaking into "an army of prospect-finders." "Properly handled, there is no more effective sales help. In most cities the number of gas company employees is larger than that of any retail establishment. Each employee is the centre of a large group of friends, acquaintances, and neighbours, with whom he is often in contact under conditions that make it easy to explain the advantages of automatic hot water service." But Mr. Scott goes on to point out that a co-operative employee sales plan is successful only if financial reward is arranged for the useful business which results from the information given by each employee; if a special price is quoted to employees in order to enable them to have demonstration appliances in their own homes; and if there is a strict rule that in no case is the ordinary employee to quote prices or to make recommendations as to the size of appliance needed, and so on. Of course, both authors offer many other suggestions for developing the gas water heating load, and neither forgets the value of home service departments.

But all the salesmanship in the world will not cut much ice unless the price is right—and by price we mean that of both the appliance itself and the gas which it consumes. The cost of gas must be such that the householder will not consider himself too greatly penalized for the added convenience of gas as compared with other fuels. On this matter no apology is needed for quoting Mr. Dexter at some length: "The willingness to accept some immediate sacrifice in order to build up a steady future revenue will be a necessary factor in determining the money to be made available for promotion. . . . Any new merchandizing enterprise will expect to invest for the promotion of sales, more than is warranted by early returns. In few other industries is the long-time return as completely assured as with the gas company, where normal use of the appliance will result in the revenue which is definitely ascertainable. It is not difficult, therefore, for the gas company to be forward-looking in the matter of promotional costs. . . . The minimum amount of money necessary for successfully launching an activity on automatic water heaters appears to be the equivalent of one-half of one year's revenue from the gas used by the heater, in addition to the expenditure of what would normally be the merchandizing profit."

B.I.F. Birmingham Catalogue.

A reminder of the approach of the 1931 British Industries Fair is to hand, in the shape of a copy of the Advance Edition of the Catologue of the Heavy and Hardware Section, organized by the Birmingham Chamber of Commerce. This catalogue of the Birmingham display takes entirely new form, designed further to assist in ready manner the interests of buyers from at home and overseas. Detailed lists of specific exhibits, in alphabetical order, are given in the nine languages which experience has proved to be of service. The same policy has been adopted with regard to finding one's way about the 11-acre permanent building. Interpreters speaking these languages will be in attendance throughout the Fair.

Gas Street Lighting in London.

We are glad to record that "The Times" on Friday last gave full publicity to the improvements which are to take place in the gas lighting of Bayswater Road. The Paddington Borough Council are at work at the moment on about one-third of the road, between Clarendon Place and Lancaster Gate. Here, 23 new gas lamps, each of 1000 c.p., are being installed at intervals of about 115 ft. They are slung centrally over the road on cables, an arrangement which gives a more even and more effective light than that from the 50 smaller pavement lamps which are being removed. A dozen of the new lamps are already working, and the rest should be completed very soon. "This," stated "The Times," "is one among several recent lighting improvements in main London thoroughfares. Both electricity and gas are sharing in these developments. Not every one realizes that some of the most important and best-lit streets in London are still illuminated with gas."

Progress of Waterless Holders.

In 1918 there were three waterless holders of a total capacity of 3,100,000 c.ft. The latest figures—they relate to Dec. 31 last—show that there are 231 such holders, of a total capacity of 611,634,500 c.ft. Germany heads the list with 92, the United States of America comes second with 43, and Great Britain third with 27, 22 of these being coal gas holders. The present state of the world capacity of waterless holders is as follows: Up to 500,000 c.ft., 31 p.ct.; up to 5 million c.ft., 55 p.ct., and over 5 million c.ft., 14 p.ct.

Fuel Research Board and Coke Ovens.

In his report for the year ended March 31, 1930, Sir Richard Threlfall, Chairman of the Fuel Research Board, states that the Board have long realized the desirability of investi-

gating the process of carbonization in coke ovens, but have not, up to the present, felt able to recommend that it should be undertaken at the Fuel Research Station. It is now felt, however, that, in view of the stage reached in the other large-scale investigations, the time has arrived when a small setting of full-size experimental coke ovens should be erected at the Station, and the Board have accordingly recommended that this should be put in hand. The proposal is still under consideration, as some questions have arisen as to the conditions of tenure of the site on which the Fuel Research Station is built. This question, and that of the provision of the necessary funds, must be decided before any actual start can be made with the erection of the plant. Discussing this matter, Dr. C. H. Lander, Director of Fuel Research, suggests that the trend of development points to the increasing use of ovens for gas making, and indicates that a free-burning coke for domestic use might also be more economically produced in this type of carbonizing plant.

PERSONAL

Herr CARL WESTPHAL has been appointed Chairman of the Board of the Thüringer Gas Company, with the title of General Direktor.

Mr. J. W. WYCHERLEY, who has been Secretary to the Malpas Gas Company, Ltd., for 21 years, is retiring from the position on medical advice. Mr. H. A. CROWTHER, the present Manager of the Gas-Works, is to be appointed to the post, holding the dual offices of Secretary and Manager.

Mr. ERNEST J. SUTCLIFFE, Bradford City Gas Engineer and General Manager, is due to retire in June under the superannuation scheme, after forty years' service. A considerable proportion of that period was served as Deputy Engineer, and Mr. Sutcliffe succeeded Mr. Charles Wood as Engineer and Manager some few years back. Mr. Sutcliffe went to Bradford from Burnley, commencing in the Yorkshire city as Superintendent of the Thornton Road Works.

OBITUARY

JOHN FOSTER.

We regret to announce the death of Mr. John Foster, late Engineer-in-Chief to the City of Birmingham Gas Department, at his home at Erdington, Birmingham, on Saturday last, Jan. 10.

Mr. Foster had a lifelong experience in the gas industry. He was practically born on a gas-works, his father being one time Engineer and Manager of the Nelson Gas Undertaking; and prior to his appointment in Birmingham in 1902, Mr. Foster was for several years Engineer to the Leigh Corporation Gas, Water, and Electricity Department.

During his Engineership at the Windsor Street Gas-Works of the Birmingham Corporation, Mr. Foster was responsible for considerable reconstruction work and extensions, the vertical retort installation there being the first large plant of its kind to be erected in this country by Messrs. Woodall-Duckham Company, Ltd.

In 1919, Mr. Foster—who was a Past-Member of Council of the Institution of Gas Engineers—was promoted to the post of Engineer-in-Chief. Under his guidance many improvements and additions were carried out at the various gas-works of the Department, to meet the growing demand for gas, while the erection of two large holders at Washwood Heath, and the planning of a complete modern gas-works to be ultimately erected on the land adjoining, are testimony to his engineering skill.

A serious breakdown in health compelled Mr. Foster to relinquish his position, and he retired from the service of the Department in November, 1929, being retained in a consultative capacity for a period of twelve months afterwards.

Mr. Foster lost his wife some few years ago, and leaves one married daughter.

The death has occurred, at the age of 84, of Mr. JOHN MARSHALL, J.P., Chairmn of the Long Eaton Gas Company. Mr. Marshall was Chairman of the Bench of Magistrates, and was formerly prominent in the public life of the town.

Mr. C. B. CLARKSON, a representative of Messrs. Lighting Trades, Ltd. (Welsbach Light Company, Ltd.), for over twenty years, died on Jan. 7.

FORTHCOMING ENGAGEMENTS

[Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.]

Jan. 17.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to Bridge Street Distribution Department, Leeds. Paper by Mr. E. R. B. French.

Jan. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council meeting in the afternoon.

Jan. 21.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of Executive Committee (11.30 a.m.), 28, Grosvenor Gardens, London, S.W. 1.

Jan. 22.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in the South-Western district, at Exeter.

Jan. 23.—INSTITUTION OF GAS ENGINEERS.—Meeting of Board of Examiners (2.30 p.m.), 28, Grosvenor Gardens, S.W. 1

Jan. 24.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to Works of Messrs. Edwin Danks & Co. (Oldbury), Ltd., Boiler Makers.

Jan. 24.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. Alder & Mackay, Ltd., Edinburgh.

Jan. 27.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 28, Grosvenor Gardens, S.W. 1, 2.30 p.m.

Jan. 27.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in the Southern District, 12.15 p.m., 28, Grosvenor Gardens, S.W. 1.

Jan. 28.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Meeting of members in the Northern district, at Newcastle-upon-Tyne.

Jan. 29.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual meeting of members in Scotland, at Glasgow.

Jan. 30.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Paper by Mr. E. W. B. Dunning, B.Sc., "Incomplete Combustion; Its Importance, Recognition, and Prevention."

June 2-4.—INSTITUTION OF GAS ENGINEERS.—London Conference.

THE NEWS OF THE WEEK

The Dewsbury Corporation, on the recommendation of their Gas Engineer and Manager, Mr. H. L. Bateman, have decided to build a new gas showroom in the centre of Dewsbury, at a cost of £4000.

A Fire Occurred at the factory of Messrs. F. Turner (Art-Metal), Ltd., Birmingham, on the night of Dec. 29 last. Fortunately the damage was not extensive, and will not interfere with production in any way.

The Bradford Corporation Gas Committee are considering an application by Messrs. W. H. Foster, Ltd., of Denholme Mills, with a view to the Gas Department's taking over the mains and gas supply to the mills and other property of the firm at Denholme.

"Monthly Accounts in Relation to Gas Companies" was the title of a paper read on Dec. 17 to the Southern Association of Gas Engineers and Managers (Eastern District) by Major R. N. Barnett, T.D., A.S.A.A., Chief Accountant of the South Metropolitan Gas Company. The meeting was held at 28, Grosvenor Gardens, S.W. 1.

The Sale of Gas at Wigan for the year ended March, 1930, amounted to £83,087, against £86,428 for the previous year, and there was a decrease of 5,611,000 c.ft. in the quantity sold. The average price paid by consumers decreased from 3s. 4·92d. per 1000 c.ft. to 3s. 3·76d. per 1000 c.ft. The net profit for the year was £7165, compared with £9881 at March, 1929.

The Dundee Tar Distillation Works have been showing a heavy loss for a number of years, and the Corporation have been considering what to do with the works. Recently a Committee were appointed, and in their report, which has now been issued, they recommend that the works be handed over to William Briggs & Sons, Ltd., Chemical Manufacturers, of Dundee, who will run them on a profit-sharing basis with the Corporation.

Fourteen Hundred Children of the employees of the Birmingham Gas Department were entertained at a New Year's party at Bingley Hall, Birmingham. The arrangements, which provided for tea and a round of entertainments, were made by the Committee of the Social and Recreation Society of the Department. The visitors were the Lord Mayor, Alderman J. H. Lloyd (Chairman of the Gas Committee), and Mr. A. W. Smith (General Manager of the Department).

Nearly 5000 Children have been invited to attend twelve parties organized by co-partner employees of the South Metropolitan Gas Company. The largest parties are being held at the Livesey and East Greenwich Institutes, where 800 and 900 children respectively will be entertained. All children whose parents are members of the Metrogas Amateurs Sports Association and affiliated clubs are invited. Tea is followed by an entertainment, and each child receives a present.

The Port Talbot Council, after discussing for some time the relative quality of the various coals in respect of which tenders were being considered for supplying the gas-works, agreed to continue with Welsh Navigation, which had given a yield during the past year of 13,000 c.ft. per ton. A plea for affording a trial to local coals was turned down on the statement of the Chairman that the Gas Manager had been conducting a series of experiments which he desired to continue with the same coal.

£1018 for Medical Charities has been raised during the past year by employees of the Newcastle-upon-Tyne and Gateshead Gas Company by weekly contributions as follows: Elswick Gas-Works, £137; Redheugh Gas-Works, £204; Howdon Gas-Works, £84; St. Anthony's Bye-Product Works, £27; Distribution Department, Newcastle, £253; Distribution Department, Wallsend, £55; Distribution Department, Chester-le-Street, £7; North Shields and Tynemouth, £177; Chief and Branch Office Staffs, £74.

The Norwich Gas-Works Recreation and Social Club gave their third annual children's party on Jan. 3. No fewer than 225 children between the ages of 4 and 12 accepted the invitation to be present, and thoroughly enjoyed themselves. The Club had been decorated, and after tea the young guests were amused by conjuring, ventriloquism, marionettes, and Punch and Judy. The party finished by each child receiving a suitable present, Mrs. C. Rhodes Armitage (wife of the President of the Club) making the presentation. Miss D. F. Abram had charge of the catering, and Mr. G. J. Taylor (Chairman), Mr. P. Banham (Secretary), and the Committee were responsible for the general arrangements. The Club itself is active and flourishing, with sections interested in all forms of outdoor and indoor sports and games, and has a membership of upwards of 400.

The Spenborough Urban District Council have approved alterations in the charges for gas and meter rents which involve a general reduction dating from the readings for January, 1931. Under the alterations the Department abandon the existing differential charge for gas through prepayment meters, such consumers being supplied—subject to the variations in meter rentals—at the same rate as ordinary consumers; and the general price of gas to all consumers is reduced by 1d. per therm, subject to existing discounts.

To Avoid Overlapping of Municipal Departments, the Leeds Corporation, in an effort to bring about economies, have appointed a special Joint Committee of representatives of the Gas, Electricity, and Finance Committees, to consider ways in which the work of the Gas and Electricity Departments might be co-ordinated—as, for instance, the avoidance of one man calling at a house to inspect the gas meter and another for the electricity meter. It is hoped to prevent overlapping and duplication in street lighting as between the two Departments, and in various other ways. The Chairmen of all Corporation Committees are called upon to consider whether it may be possible to remove or prevent overlapping and over-staffing.

Beginning on the Foundations in March and on the steel structure in May, Messrs. Robert Dempster & Sons, Ltd., of Elland, completed in December a three-lift spiral-guided gasholder for the Elland-cum-Greetland Gas Company, of over half-a-million c.ft storage capacity. The 1,250,000 gallons of water in the tank were pumped from the Calder and Hebble Navigation Company's canal close to the gas-works by the Gas Company's old fire engine. Despite the competition of electricity and the severe trade depression which has affected the industrial load in recent years, the Elland Gas Company's output and sale of gas grows steadily. In 1900 the Company supplied 95 million c.ft. of gas in the district. Last year the supply was 160 million c.ft. Work on the erection of the new holder has been largely by local unemployed men.

The Gasholder as Advertising Medium.

One of the gasholders of the Haywards Heath District Gas Company, we are informed by Mr. A. E. Whitcher, Engineer and Secretary, is being used for advertisement purposes by a large super-cinema at Brighton. The holder faces the main railway at Haywards Heath, which connects not only with Brighton, but also with Lewes, Eastbourne, and Hastings.

Mr. Whitcher suggests that this form of advertisement is unique from the cinema point of view in this country.

Institution of Mechanical Engineers.

Formation of Southern Branch.

On Thursday, Jan. 8, was held in the Municipal College, Portsmouth, the Inaugural Meeting of the Southern Branch of the Institution of Mechanical Engineers.

The Lord Mayor of Portsmouth, Councillor Walter Gleave, J.P., welcomed the members who had assembled from the counties of Dorsetshire, Hampshire, and Sussex, from which the members of the new branch will be drawn. The chair was to have been occupied by Mr. William Patchell, M.Inst.C.E., a Past-President of the Institution of Mechanical Engineers, and Chairman of the Local Branches Committee, but he was kept away owing to indisposition. In his absence, the President, Mr. Loughnan St. L. Pendred, took the chair.

The Lord Mayor congratulated the Council on the attainment of a Royal Charter of Incorporation last year, which, he thought, would have the effect of inspiring the Institution to even greater efforts than had been known since its foundation in the year 1847 by the great George Stephenson.

Mr. Pendred expressed the thanks of the Institution to the Lord Mayor for the honour of his presence on the occasion, and went on to particularize the important work on which the Institution had been, and was at present, engaged, including the establishment, in conjunction with the Board of Education, of National Certificates in Mechanical Engineering Science.

Mr. W. Abbott, B.Sc., Head of the Engineering Department of the Municipal College, Portsmouth, Acting Hon. Secretary to the proposed Southern Branch of the Mechanicals, then gave his report on the preliminary steps which had been taken

to form it, culminating in the inaugural meeting. He gave a list of papers which had up to date been offered for reading and discussion.

On the motion of the President, Sir George Goodwin was unanimously elected Chairman of the Branch, which entitles him to a seat on the Council of the parent body in London.

The resolution for the election of the first Committee of the branch was proposed by Sir Richard Skelton, K.C.B., Engineer-in-Chief of the Navy. Sir John Thornycroft seconded. The names were as follows, all being unanimously elected: Messrs. T. Carmichael, M.Inst.Gas E., Engineer and General Manager of the Portsmouth Gas Company; Dr. Halton Thomas, Eng.; Capt. A. F. White, R.N. (ret.); Major F. X. Miller, R.A.O.C.; W. Abbott, B.Sc.; H. Parsons, J.P.; W. W. F. Pullen; H. C. Head, M.Inst.Gas E.; the Professor of Engineering at the University College, Southampton; Major H. J. Trump, R.A.O.C.; P. Salmon; Capt. Upton Marshall; and Walter T. Dunn, ex-Secretary of the Institution of Gas Engineers.

Mr. Abbott was unanimously elected Hon. Secretary; and proposed that the standard rules drawn up by the Council for the regulation of local branches be adopted; Major Miller seconded, and the proposition was carried *nem. con.*

A hearty vote of thanks to the President concluded the proceedings.

New Industry in New Zealand.

Gas Meter Making at Christchurch.

Newspapers recently to hand from Christchurch, New Zealand, state that a new industry has been launched in Christchurch—the manufacture of gas meters. On Nov. 21 last complimentary references to the initiative of the Company responsible, Messrs. Alder & Mackay, were passed at a luncheon in their honour at Warner's Hotel, which was attended by many representatives of the gas industry.

An inspection of the new works disclosed that the Company have already established stocks of equipment, and preparations are being made for the installation of machinery which will enable manufacture to proceed on a scale commensurate with the needs of the South Island.

Mr. E. Rabbidge, New Zealand representative of the Company, conducted a party of visitors through the factory, which is in Armagh Street. The works are the first of the kind in the South Island, supplies having previously been drawn from Wellington. Already business has been so satisfactory that two additional men have been engaged.

At the luncheon Mr. Woolf (President of the Canterbury Manufacturers' Association) said it gave him peculiar pleasure to welcome the representatives of a new industry to Christchurch. They were what the country needed, in addition to more population. If it had them the unemployment problem would soon disappear out of sight. The firm had been started 80 years ago in Edinburgh, and the first branches overseas were established in Sydney and Wellington in 1910. The branch in Christchurch was going to prove a great convenience to other industries, in the saving which it would effect in freight and time. At the same rate of growth as was being shown at present, in a quarter of a century Christchurch would have a population of 250,000. "It is a great compliment to Christchurch for this firm to start here," said Mr. Woolf. Proposing the toast of "Messrs. Alder & Mackay," Mr. Woolf wished the firm success in their new venture.

Good Progress in Wellington.

Responding, Mr. Rabbidge said that twenty people were now employed in their Wellington branch, and it had made very good progress. In the last six years half of the business in New Zealand had been with the South Island, and for the purpose of relieving the Wellington works and catering better for customers, it had been decided to establish a branch in Christchurch. It was realized that the business depended on population, and it was hoped later on to employ more men.

"The Gas Industry in New Zealand" was proposed by Mr. Rabbidge. It had seen wonderful changes, he said. In the old days it was regarded as an automatic monopoly, but it paid good dividends. It did not collapse because the authorities connected with it realized that it had to meet the conditions of the day. New policies were adopted to meet competition. Times were not the best now, but the gas industry was getting along better than anything else he knew of. There was nothing to be disturbed at, as the country could not do without the industry, and it gave good service. Even down to the village gas-works, progress was being made. The reason for the success of the gas industry was the enthusiasm and enterprise of the companies. Christchurch had taken the lead, and the results spoke for themselves.

Mr. F. W. J. Belton (Engineer to the Christchurch Gas Company) said the secret of the success of the gas industry was a realization of the fact that service was the keynote of success, which remark might be applied to all industry.

THE NEWS—continued.

Increasing Uses of Gas.

The Industry's Part in Sheffield Trade Supplements.

Industry in 1930 and its prospects for 1931 were brought home to readers of the "Sheffield Daily Telegraph" on Dec. 31 by the issue of the Special Trade Supplement. This publication—running into the large number of sixty-four pages—constitutes a review of activities, local, national, and world-wide, in the realm of commerce. While naturally local and district industries claimed a great deal of the space available, the articles were by no means confined to such.

The Gas Industry had an important section in the publication, while the whole of the front cover of the Supplement was devoted to a striking advertisement for gas, in four colours, above the caption "Industrial Sheffield Relies on Gas"—a valuable piece of propaganda work by the Sheffield Gas Company.

The article within the Supplement gave a résumé of the activities of the industry, paying particular attention to developments in the industrial application of gas in Sheffield.

What the modern, practical young housewife wants, stated the writer, is a home equipped with clean, economical, labour-saving equipment. The gas industry is making such happy, labour-saving homes possible to-day in every part of the country, among rich and poor alike. Gas equipment is inexpensive to install, economical and reliable in use, easy to manage, and easy to keep clean. The article went on to describe many of the labour-saving gas appliances of to-day, paying attention also to the efficiency of modern gas lighting.

Industrial Section.

Although Sheffield manufacturers are suffering from the effects of the slump, and the looked-for recovery in trade has not only not materialized but appears to be as far off as ever, still the demand for gas-fired furnaces and other industrial appliances during the year has exceeded that of last year. In addition to the new industrial appliances which have been supplied and fixed by the Gas Company, many solid fuel fired furnaces and oil fuel fired furnaces have been converted during the past year to burn gas, and also a large number of new gas-fired furnaces have been built by consumers themselves.

Mention is made of the Sheffield Company's furnace demonstration room, which is staffed with experts on heat treatment of ferrous and non-ferrous metals, and it is available at any time for the assistance of industrial users of gas. Here most of the modern types of furnaces and heating apparatus, specially designed for the Sheffield trades, can be seen and full-scale tests arranged with the manufacturers' own material if desired.

At the present moment the Company are fitting an "Electroflo" temperature control equipment to one of the furnaces in order to demonstrate that the temperature of a gas-fired furnace can be readily and easily automatically maintained at any desired heat for an indefinite period.

The Gas Company's industrial department, it is stated, is never content to rest on results obtained, but is constantly trying to improve them. This spirit of never being satisfied is not confined to the industrial department of the Company, but permeates the whole policy where service to the consumer is concerned.

Another Trade Review Features Gas.

On the same date another Sheffield newspaper, "The Independent," also published a comprehensive Trade Review Supplement in which the Gas Industry again largely featured. In this case also the Sheffield Gas Company secured the front cover space for a further striking industrial gas advertisement, while an article within gave a somewhat similar résumé of the industry's activities, concluding with an interesting statement of "What a Therm of Gas Will Do" in the Sheffield area.

Another interesting article in this Trade Review deals with the South Yorkshire Gas Grid, which was referred to as "the first adventure on what might be called a national scale." The scheme, as approved by the Government Committee, briefly is as follows:

It will collect gas from 19 coke oven plants, and is designed to take a maximum volume of 80 million c.ft. of gas per day.

This gas will be purified at the coke ovens before being delivered into the network, and not be piped to the gas-works for purification.

Compressor plants will be installed at the coke ovens; and their cost and the cost of operation, therefore, will have to be met by the Coke Oven Owners, but will be covered by them in the price of gas. The total cost of compressor plants will be £63,400.

There will be 73½ miles of mains, made of steel and varying from 6 in. to 30 in. in diameter; with hessian cloth and bitumen coating. The cost of the mains (excluding laying) will be £232,800, and the cost of laying them £241,700.

Home Baking Competition in Newcastle

More than 12,000 Northern housewives entered for the Bread Baking Competition in which the Newcastle and Gateshead Gas Company co-operated with Messrs. Hindhaugh, Ltd., Millers, Newcastle-upon-Tyne. The multitude of loaves at the Town Hall resembled a huge bakery, the display tables covering nearly every inch of floor space.

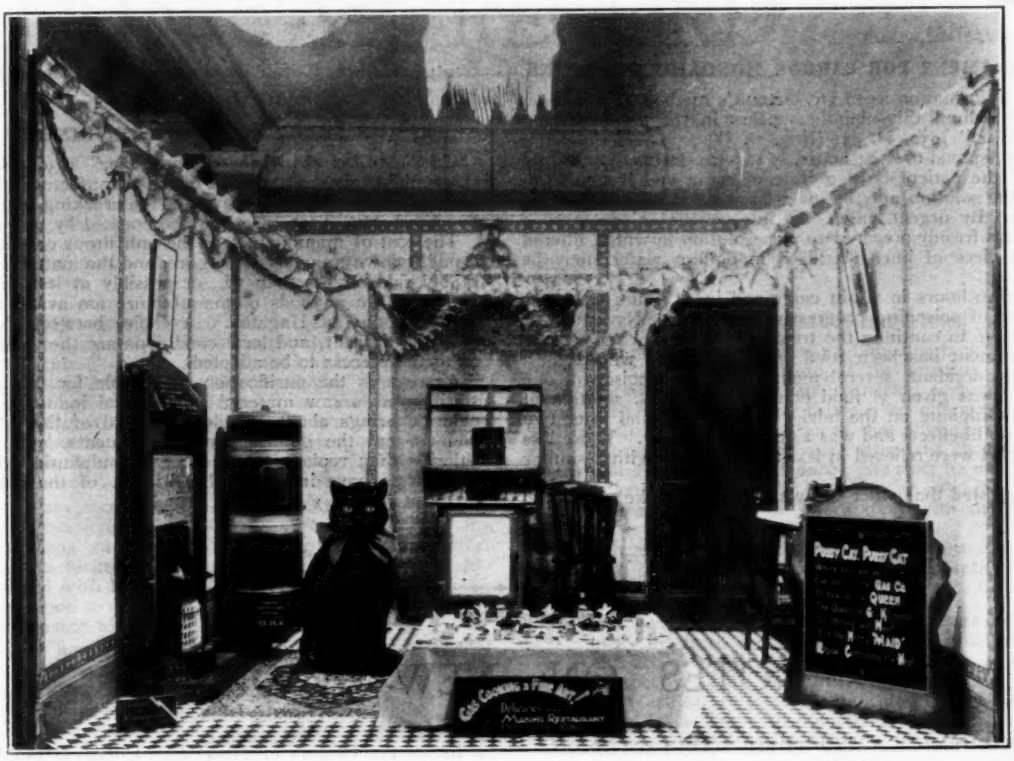
The general standard of baking was high, and expert judges were faced with the huge task of selecting the prize-winning loaf out of the 12,000 entries. The winning loaf carried with it a prize of £50, and an all-enamelled gas cooker for the best loaf baked in a gas oven. No fewer than 350 further prizes were awarded.

After inspection by the public, the prize-winning loaves were displayed in the Newcastle Gas Company's windows. A commendable feature of the competition was that all the loaves were distributed among the deserving poor and local charities.

[*Photo. by the "Newcastle Daily Journal."*

Attractive Christmas Window Displays

These photographs are of the Christmas displays arranged by the Bournemouth Gas and Water Company in their central showroom windows. They attracted a great deal of attention from the public.



IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

NEW TREATMENT FOR CARBON MONOXIDE POISONING.

Further information as to Dr. Artault's method of treatment by use of sodium thiosulphate appears in the "Journal des Usines à Gaz," 1930, **54**, 531 (Nov. 5).

The dose, spread over 24 hours, is 125-300 grains dissolved in water. If the patient is in a state of coma and is unable to swallow, the solution may be given by a nasal tube or even as an enema. In urgent cases, an intravenous injection of 5 drachms of a freshly prepared 10 p.ct. solution in water, filtered through a piece of linen sterilized in boiling water, may be given.

Within 6-10 hours in slight cases and in 24 hours in severe cases, signs of poisoning progressively pass off. Nevertheless, it is advisable to continue the treatment for a week.

The treatment has been tried on a gas-works where, as a result of an accident, several men had become poisoned, one badly. He was given 3½ fluid ounces of a 2 p.ct. solution of sodium thiosulphate on the advice of a doctor, and after two hours felt no ill-effects and was able to walk home. Those less badly affected were relieved in less than an hour with a similar dose.

It is suggested that other gas-works should make use of the treatment since, if its efficacy is confirmed, it would prove of very considerable service.

ALUMINIUM CHLORIDE IN THE REFINING OF BENZOLE.

C. Simon, in "Chimie et Industrie," 1930, **24**, 1317-1321 (December), gives an account of the manufacture of anhydrous aluminium chloride and its use in the cracking and refining of hydrocarbons. Tars, also, may be cracked by use of it.

The cost of manufacture of the anhydrous chloride has been brought down to a very low figure, and the material can be profitably sold at less than 3d., or possibly at less than 2d., per pound. Two methods of manufacture are available, those of MacAffee and of Haglund. A choice between the two processes is difficult, and local conditions are the deciding factors as to the process to be adopted.

As regards the purification of benzole for use as a motor spirit or as a raw material in chemical industry, aluminium chloride brings about complete removal of the sulphur compounds and the gum-forming constituents, and use of the chloride may replace treatment with sulphuric acid. Large-scale tests have indicated that 4 p.ct. of the chloride gives excellent results.

NOTES ON NEW BOOKS

BRITISH CHEMICALS AND THEIR MANUFACTURERS.

The Association of British Chemical Manufacturers have published an Official Directory with a view to giving purchasers in all parts of the world information as to the products manufactured by members of the Association. The Directory is printed in English and in five other languages—French, Spanish, Italian, Portuguese, and German—and the publishers trust that it will be of special use, not only to His Britannic Majesty's Commercial Attaches, Consular Officers, and Trade Commissioners, but to the various Government purchasing departments throughout the world.

The book contains an introduction and index in each of the six languages followed by a list of the Council and Officers of the Association of British Chemical Manufacturers, together with a directory of the members. This is followed by the classified list of British Chemicals preceding a list of proprietary and trade names. Finally there is a key to the classified index in the five languages aforementioned.

The Directory was last issued in 1929; and it has now been revised and brought fully up-to-date, and this issue will be known as the 1931 Edition. The Association express their intention of producing an up-to-date edition every second year. The present edition varies from that of 1929 in two important particulars. In the first place, a very appreciable extension of the tables of proprietary and trade names has been effected, as past experience has shown this section to be of considerable value. In addition, omission of the "Uses" column, which appeared in the "Classified List of Products" section of the 1929 and previous editions, has made possible a reduction in the size of the volume, and made it a more handy book of reference.

The Association state that they are confident that previous editions have satisfied the demand for information on the use of practically all the chemicals appearing in the present volume, while it appeared difficult amply to modify the information if the volume was to remain a directory. The majority of recipients of the present edition have already received copies of the 1929 and earlier volumes, and will consequently be able to refer thereto for information on the use of chemicals listed, while manufacturers will at all times be willing to supply similar but more elaborate information such as could not easily be incorporated in a directory.

BRITISH CHEMICAL PLANT DIRECTORY.

Following upon the above is a kindred publication in the shape of the British Chemical Plant Directory. This contains a list of the Officers of the British Chemical Plant Manufacturers' Association (the publishers of the book), a directory of the members of the Association, and a classified list of products and services. The latter list has been very efficiently compiled, reference to the manufacturers of any item of plant sought being rendered rapid and certain. The detail given is amplified by the makers' own announcements in the advertisement section of the Directory.

Perusal of the volume shows that British chemical plant manufacturers are able to supply the best and latest types of plant required for any chemical operation. The latest scientific principles are embodied in their design, and the workmanship is in every case of the highest quality. The Association state, in the course of the introduction, that they have been, and still are, active in the standardization of plant where such standardization is possible and desirable, and in the study of the most suitable constructional materials for use with the various chemicals—many of them corrosive—with which the plants have to deal.

MECHANICAL WORLD YEAR BOOK, 1931.

This useful handbook, published by Messrs. Emmott & Co., Ltd., of 65, King Street, Manchester, at 1s. 6d. net, introduces a number of new features in the 1931 edition, making the publication a source of reliable information on important modern engineering problems.

The handbook, besides containing the calendar and diary for the year, has considerable practical information in the shape of temperature conversion tables, comparative stresses, price equivalents, pipe and tube specifications, oil and diesel engines, boilers and boiler construction, condensing plant, &c. The sections on steam boilers, internal combustion engines, belt conveyors, hydraulics, and searing have been re-written and enlarged; those on steam engines, turbines, condensers, along with many others, have been retained, in an attempt to eliminate many lengthy calculations which are frequently involved in matters connected with the design of power plants, and to present in a concise form information and data often required in workshop practice. Tables of logarithms, trigonometrical ratios, functions, and equivalents complete the technical matter.

Interesting sections deal with gas engines and fuels used in gas producers, together with producer gas average composition as compared with town gas. Altogether a very comprehensive handbook which should prove an up-to-date source of reference for engineers.

THE "JOURNAL" TECHNICAL RECORD

Which also contains Full Reports of Meetings of Gas and Allied Associations ———

Distant Pressure Control

By H. C. WIDLAKE, A.M.I.E.E., of Plymouth.

[Paper before the Western Junior Gas Association.]

In preparing this paper I have found myself in a somewhat unusual position, inasmuch as I am not only the user, but the actual manufacturer, of the instruments which form the basis of my communication to you this afternoon. It is, in consequence, necessary that I should point out that in so far as concerns the advantages of distant pressure indicators and controllers, my remarks are generally applicable to any system which embodies in its furnishings the essential features of simplicity, accuracy, and maintained reliability.

In the ordinary course of the development of a gas undertaking it is often noticeable that in matters of efficiency the distribution tends to lag behind the manufacturing side. Modern manufacturing plant operated under efficient management, combined with keen buying in the coal and oil markets, can be relied upon to produce gas at a price which leaves very little economic cloth to cut.

The manner, however, in which the finished product is distributed to the consumers often leaves much to be desired, and the distribution engineer finds himself up against difficulties which cannot always be ascribed to any lack of foresight on the part of an earlier generation.

Efficient distributing arrangements and good salesmanship have never played so great a part in the development of the gas industry as they do to-day, and the modern conditions which have to be met render it essential that the control of district pressures shall be regarded in the light of an exact science.

The old and generally used method of controlling district pressures are too well known and long suffered by you to warrant more than a passing reference. Instantaneous information as to pressure conditions at points remote from the works was an ardently longed for but seemingly impossible achievement, and the nearest approach to scientific control lay in the use of graphic recorders situated at key points on the district.

By "key points," I refer to that point on a district at which the maintenance of a certain W.G. ensures that the area as a whole is adequately supplied. Incidentally it may be remarked that the key point is not necessarily the point of lowest pressure.

These charts studied in conjunction with the chart at the works end of the district main enabled a system to be built up, based on the assumption that the demand on any particular day would be substantially the same as on the corresponding day of the previous week, due allowance being made for differences of temperature.

As a check upon the pressure attendant's application to his job, the system is an excellent one, but its fatal weakness lies in the fact that the information afforded comes to hand a day after the existence of the conditions of which it furnishes an accurate record.

The most generally used method for conveying immediate information to the works consists of telephonic communication between the works staff and district pressure testers. The word "immediate" is not strictly accurate in this connection, as the information communicated is necessarily belated owing to the interval which must elapse between the actual observation and the receipt of the report at the works. The time lag depends upon the agility of the man, the distance between the point of test and the nearest telephone, and the delay in getting the call through. This class of service is not likely to cost less than sixpence per report.

So far as accurate and immediate information is concerned the existing methods are utterly useless, and when any irregularity does occur, the first intimation the works receive usually takes the form of the presence on the telephone of irate consumers.

DISTANT PRESSURE INDICATORS.

The object of a distant pressure indicator is to furnish at the works a continuous indication of the pressure prevailing at some selected point on a distant district, perhaps some miles away. There is no time lag between an alteration in pressure at that point and the intimation of that alteration at the works end. If, for instance, a pressure attendant chooses to glance at his dial a thousand times during his shift he would receive a thousand pressure reports. In other words, the instrument synchronizes the desire for information with the information itself.

The advantages attending the use of such a system are too obvious to need more than a passing reference. Briefly they are:

A. The pressure attendants at the works are kept continuously informed as to the conditions on distant districts, and are able to keep a level pressure line at such points irrespective of the draught on the main.
B. Irregularities are instantly indicated and valuable time is saved in dealing with the situations so caused.
C. Disputes between the works and the distribution staffs on the subject of district pressures are no longer possible.
D. Where boosters or compressors are used, considerable saving in power costs will be effected, as such units of plant will only be used when required, and to the extent actually required. The need for running up early, shutting down late, and over-running when on load, all in order "to be on the safe side," will no longer exist.

It is difficult to assess the value of these instruments in relation to the psychological effect on the men responsible for the proper maintenance of district pressures. This factor can only be realized at its approximate value by entering into conversation with men who have enjoyed the absolute certainty which this method of control ensures.

WIDLAKE'S APPARATUS.

The instrument devised by myself is of the proportionate current type—*i.e.*, it maintains in its circuits a current of electricity which, at all times, is directly proportional to the pressure prevailing at the distant point. It consists of two distinct parts—A, the transmitter which is suitably housed at the distant key point, and B, the indicator which is installed at the works or pressure control station.

The transmitter shown at the right-hand side of the photograph in fig. 1 is a **U** tube with its limbs disposed concentrically. The inner, or open, limb is of about 9 in. in diameter, while the overall diameter of the container varies between 10 and 12 in. according to the maximum capacity of the apparatus.

Although the instrument is calibrated in inches W.G. the container is oil lined with a special oil of 0·924 S.G., with the object of eliminating all risk of freezing. The connection to the main is made to the outer closed limb, and variations in pressure cause a corresponding rise and fall in the oil level in the inner and open limb. A tinned copper float carried on this column of oil accommodates a stoneware trough containing about 3 lbs. of mercury disposed in the form of a ring about 3 in. in diameter and having a depth of 3 in.

The top of the container is fitted with three screwed pillars on which is accommodated a three-armed spider capable of vertical adjustment on those pillars and carrying a 4-in. diameter ebonite base pierced with a number of downward projecting hard drawn copper needles whose points form a helix. In the centre of this base is a ¼-in. diameter brass rod which, passing through an aluminium cap on the mercury trough, acts as a locating guide in relation to the rising and falling float. Above the ebonite needle base an 8-in. diameter trough of

insulating material is fitted for the reception of the fine resistance coils which serve to regulate the flow of current.

These coils are made up of double silk covered high-resistance wire, and after the final calibration of the instrument has been carried out they are laid in the trough and run in solid with melted paraffin wax, thus protecting the fine windings against all mechanical and atmospheric injury. From the top of each needle a tapping is carried into this bank of resistances, the junction between the coarse tapping wire and the fine resistance wire being well under the level of the solidified paraffin wax.

At the side of the container, an unloader is fitted, in order that the float shall not be oil logged in the event of the pressure for which the instrument is designed being exceeded. Should this happen, a dip pipe in the outer limb is unsealed, and gas with a small quantity of oil is blown into the unloader. The gas passes freely away through a vent pipe, and the oil flows gently back into the inner limb.

The indicator, right-hand panel, fig. 1, consists of a milliampere meter scaled in units of gas pressure mounted on a 30-in. by 12-in. enamelled slate panel, together with an adjustable resistance and three shoes marked "Line," "Leakage," "Check." A single plug is provided for insertion into either of these shoes according to the nature of the information required. When the plug is inserted in the line shoe, the meter indicates the pressure at the distant point, and will continue to so indicate as long as the plug is left in that shoe.

The purpose of the leakage shoe is to enable the instrument to serve the purpose of an earth detector in relation to the connecting circuit between the indicator and the transmitter. The insertion of the plug into this shoe connects both limbs of the circuit to one pole of the battery, and earths its other pole. In this position the meter indicates whatever current may be leaking to earth, due to impaired line insulation or broken insulators. Where a considerable portion of the connecting circuit is run overhead a fair amount of leakage current may be detected in very wet weather, and due allowance is made for that current in reading the instrument. A fallen wire or an insulation failure will give a full-scale reading, and indicate the existence of an "earth fault" which cannot be accounted for by a heavy rainfall.

The purpose of the check shoe is to enable a check to be kept upon the battery voltage upon which the accuracy of the instrument largely depends. It is difficult to determine the total voltage of a battery of cells by the use of the small pocket voltmeter so widely used. Errors of observation are bound to occur, and the lower the scale of the meter used, the greater will be the total error. In this instrument there is no need to use any extraneous voltmeter to determine the battery voltage. When the plug is placed in the check shoe the meter becomes a voltmeter, and the pointer swings to the neighbourhood of a heavy red line marked on the dial. If it registers direct on this line, the battery is stabilized at the voltage to which the instrument was wound, and, if the pointer fails to reach the line, the degree of discharge is indicated.

The adjustable resistance of the slider type provides a means of compensating for the minor difference in line resistance, usually due to seasonal temperature variations, which occur from time to time.

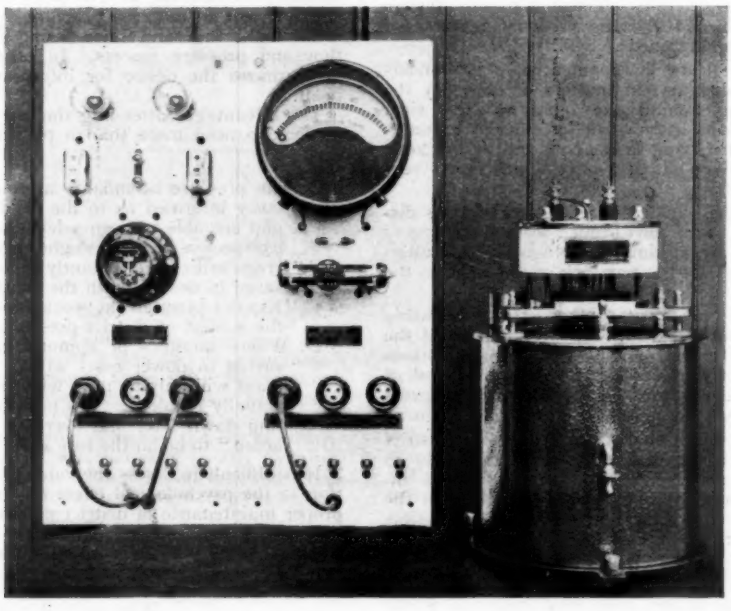


FIG. 1.

The Connecting Circuit.

The circuit connecting the indicator with the distant transmitter is provided by the General Post Office Engineering Department, the correct form of application for this accommodation being a "loop line without instruments." Their charge for this service is £8 per radial mile per annum, and the line is provided and maintained on the condition that the renter proves his own connected apparatus clear of faults before reporting a "line fault" to the telephone engineers. Arrangements for renting the circuit are made through the Contract Department, and all subsequent communications regarding, say, the clearing of a fault are made direct to the local Telephone Engineering Department.

The question is often raised as to whether it would not pay a gas undertaking to provide its own circuit for this purpose when the laying of new mains offers the opportunity of running a cable system in the same trench. Now, if it were intended to lay such a cable direct in the ground, an armoured, and consequently an expensive, conductor would be required, and the alternative would take the form of an iron conduit system through which a relatively cheap cable would be drawn. Whatever system was installed, the capital charge would be greatly in excess of the £8 per radial mile tariff of the G.P.O., while the cost of locating and rectifying a fault would be a prolonged and costly business.

In very exceptional cases an argument may exist for the installing of a private circuit, but, as a general rule, the leased line is by far the most profitable proposition.

The Diagram.

A diagram of connections of a Widlake Distant Pressure Indicator is shown in fig. 2, and it will be noted that the apparatus is connected in a plain series circuit.

When the plug is in the line shoe, current flows from the small set of cells at the works end, through one limb of the leased circuit, to the feeder needle in the distant transmitter. It passes through whatever resistance may be in circuit at that point and returns, via the other limb of the circuit, to the other pole of the battery at the works. This current is metered by a milliampere meter, which reads direct in units of gas pressure. The magnitude of this current is determined by the amount of resistance in circuit at the transmitter, of which total resistance a portion will always be in circuit and a portion short-circuited according to the position of the float.

In the diagram the gas pressure within the body of the transmitter is 3 in. W.G. and the float is consequently in such a position as to keep all the needles up to the 3-in. needle short-circuited by immersion in mercury. Now suppose that the pressure rises to 32 tenths, the float will rise a little, and the needle corresponding to 32 tenths will become immersed, and a further portion of the resistance will be short-circuited. The current in the circuit will increase and the meter pointer will rise from 30 to 32 tenths.

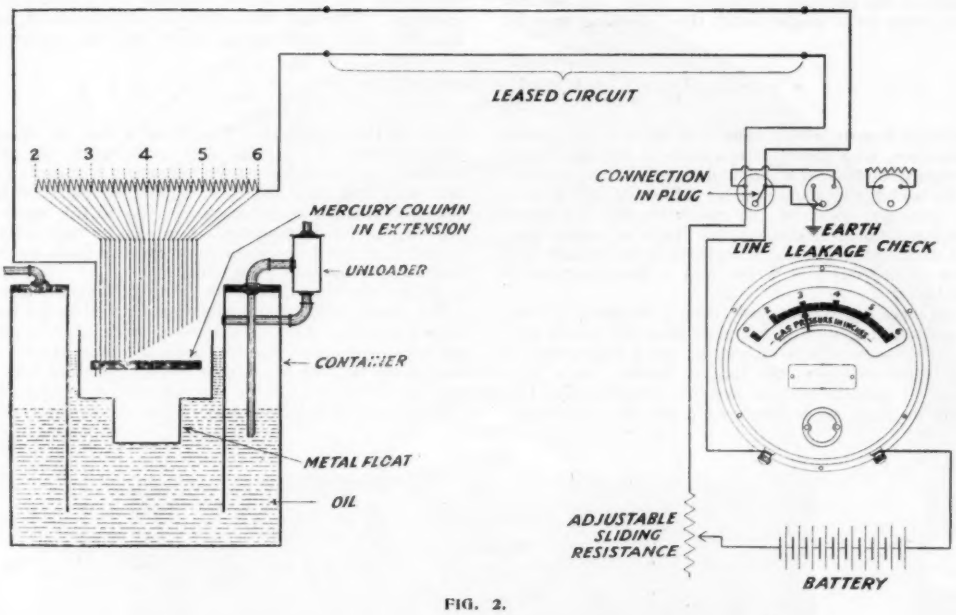


FIG. 2.

Every two tenths increase in pressure at the distant point will bring an additional needle into contact with the mercury, short-circuiting a further amount of resistance and causing a corresponding increase in the current metered by the indicator.

Using the Instrument.

The manner in which a distant pressure indicator is used varies according to the practice of different undertakings. Some users only plug in at times of varying demand and for occasional spot readings. So far as the welfare of the instrument is concerned, the more it is used the better, as the batteries keep in a healthier condition if given constant work. Another argument in favour of its constant use lies in the fact that one of its most important purposes is to give a timely warning of any irregularities. When boosters are used to augment the pressure at times of heavy demand it is usual to run them entirely in the light of the information transmitted from the distant point, running them up only when no further increase of pressure can be obtained by the loading of the station governors. With the boosters on load their speed is regulated to give the desired pressure at the key point, and there is no need to over-run the machines in order to be on the safe side.

The economies in power so effected are often, of themselves, sufficient to justify the purchase of an instrument, apart from the many other advantages. Where pressure-augmenting plant is only used intermittently, the saving in power is naturally not so substantial as in the case of a high-pressure system supplied by continuously running compressors. On such an installation the use of a distant pressure indicator permits of steam driven compressors being run under plain throttle control at just that speed necessary to maintain the desired pressure on the inlet side of the district high-pressure governors. In the absence of any definite information as to the pressure prevailing at distant points it is too often the case that plant of this class is over-run, simply to be on the safe side.

Batteries.

When a distant pressure indicator is kept in continuous use, the battery requires recharging about once a fortnight. The use of larger cells would, of course, ensure a longer battery duty, but against this advantage must be placed the fact that the small current taken by these instruments would not be sufficient to keep the cells healthy. Where an electricity supply service exists in the neighbourhood of the indicator it is an easy matter to arrange for charging the cells *in situ*, but in the absence of such a convenience the cells must be taken periodically to a charging station; and the need for a duplicate battery is indicated.

Line Faults.

Faults on the leased circuit are infrequent, but when they do occur the user of the instrument may be sure of a prompt response to a clearly expressed complaint. When the plug is in the line shoe a fault will either keep the pointer to zero or will cause it to rise hard over to the extreme right-hand side of the meter scale, according to whether the line is disconnected or short-circuited. Either of these faults may be associated with an "earth," and the insertion of the plug in the leakage shoe will indicate this condition.

The procedure to be followed in the case of the line faulting is extremely simple. The line should be disconnected at both the indicator and the transmitter ends, and the local Telephone Engineering Department should be notified that the circuit is defective and has been disconnected from the renter's instruments.

Graphic Recorders.

Some users of distant pressure indicators regard a graphic recorder as an essential feature of the apparatus; and to meet this requirement a recording milliampere meter is connected in series with the indicating meter. It is pointed out that the characteristics of an indicating and a recording meter are somewhat different. The former is practically frictionless and instantly responds to the minute increments of current set up by the functioning of the distant transmitter. The graphic recorder has to work against a definite amount of pen friction, which the most delicate balancing cannot eliminate, and by comparison with its team mate is sluggish. If the installation has to endure any rough treatment due to, say, a line short which causes violent shocks to the movements, it is noteworthy that the recorder suffers the most, its accuracy being impaired to a far greater extent than is that of the indicating meter.

The Instrument Scale.

It is not generally realized that distant pressure indicators can be scaled to meet almost any requirements, and are neither more complicated nor more costly if, for any reason, the user happens to prefer a scale which is coarse in some parts and fine in others.

The standard instrument can be fitted with a maximum number of forty contact points, corresponding to forty divisions on the meter scale, and it is a matter of complete indifference, as regards both the manufacture and the working of the instrument, whether the required number of divisions are uniform or vary in degrees of fineness.

Take, for instance, a distant pressure indicator built for a maximum pressure of 10 in. W.G. In the first place, few engineers have any interest in pressures below 2 in. W.G., so that it is probably quite sufficient for the lowest reading to be 2 in. W.G. Such an indicator could be calibrated to any of the following scalings, providing the purchaser makes up his mind as to what will best suit his particular purpose, and states the scale he prefers when placing the order for the instrument:

(*a*) 0 2 3 4 5 6 ⅓ 7 ⅔ 8 ⅓ 9 ⅔ 10
(*b*) 0 2 3 4 5 ⅓ 6 ⅓ 7 ⅔ 8 9 10
(*c*) 0 2 3 4 5 6 7 8 9 10
(*d*) 0 2 3 4 ½ 5 ½ 6 7 8 9 10

As an example of the extreme calibration which can be provided in special cases on a single scale, the following may be of interest :

(*a*) 0 2 • • • • 3 ¼ 4 ½ 5 ½ 6 ½ 7 8 9 10 ——— 1 ½ 2 ½ 3 ½ 4 ½ 5
(- - - - - - - - - - - - - - - - - Ins. W.G. - - - - - - - - - - - - - - - -) (Lbs. per sq. in.)

This is a valuable feature which cannot be studied too closely by a prospective user, who can choose a scale of the maximum value having regard to his own particular requirements.

The ease with which the scale can be calibrated, often in a very irregular manner, to meet the needs of the individual user is a peculiar characteristic of this type of apparatus. If this feature were more generally realized it is certain that these indicators would enjoy a wider and a less stereotyped sphere of usefulness.

When, for instance, a growing undertaking acquires a small neighbouring works, it generally happens that the small gas-making plant on those works is scrapped, and a high-pressure bulk supply is introduced into the largest holder, via a governor. In order to operate such a system economically, two essential conditions have to be met—*i.e.*, (*a*) the compressor attendant must be kept informed as to pressure on the inlet of the distant governor, in order that unnecessarily high power charges may be avoided; and (*b*) information shall be available as to the position of the distant holder, so that the compressing plant may be worked accordingly.

These conditions are generally met by telephonic communication between the two points, necessitating the presence of an employee at the holder station. A single distant pressure indicator working in conjunction with a small, inexpensive apparatus installed at the foot of the holder will supply the required information.

The scale of such an instrument would be calibrated as follows :

0 10 15 20 ½ 1 1½ 2 2½ 3 3½ 4 4½ 5 70 75 80
Holder height. Pressure in lbs. Holder height.

Maintenance.

Apart from periodical charging of the battery, the only attention required by the instrument is a monthly visit to the transmitter for the purpose of cleaning the contact points and the mercury. The two line wires are disconnected, and, the three knurled pillar nuts being taken off, the spider can be lifted clear of the container. The needles can be cleaned by gently wiping over with a clean soft cloth, while the cleaning of the mercury is accomplished by imparting a spinning movement to the float and inserting a scoop-shaped piece of blotting paper into the surface of the mercury ring in the same manner as a turning tool is introduced to a job in the lathe. It will be found that the dust on the mercury will back up into this scoop, leaving the surface quite clean.

When the transmitter is being cleaned is also the time to effect the necessary compensation for resistance variation in the leased circuit. The resistance of this circuit is prone to undergo certain changes due to seasonal temperature variations, and the slider type of adjustable resistance mounted on the indicator panel is provided for the purpose of compensating for such variations. While the instrument is being cleaned, the two wires which have been disconnected to permit of the removal of the spider should be twisted together, the effect of this connection being to cause the indicator at the works end to rise to its highest reading. If the battery voltage is stabilized, the pointer should register centrally on this top reading, and if it fails to do so it should be brought to that point by operating the slider resistance in the direction which gives the desired effect. If the instrument is in proper order and the battery is in a fair state of charge, the pointer should not register far away from this last division, and the necessary adjustment will be effected by a small movement of the slider.

Suppose that the movement of the slider to effect the desired adjustment has been sufficient to introduce, say, 4 ohms into the circuit, thus increasing the total resistance of the circuit by 4 ohms. This means that, since the instrument was last cleaned and adjusted, the resistance of the line has been reduced by 4 ohms due to temperature variations, and this has now been compensated for by the insertion of an additional 4 ohms back into the circuit.

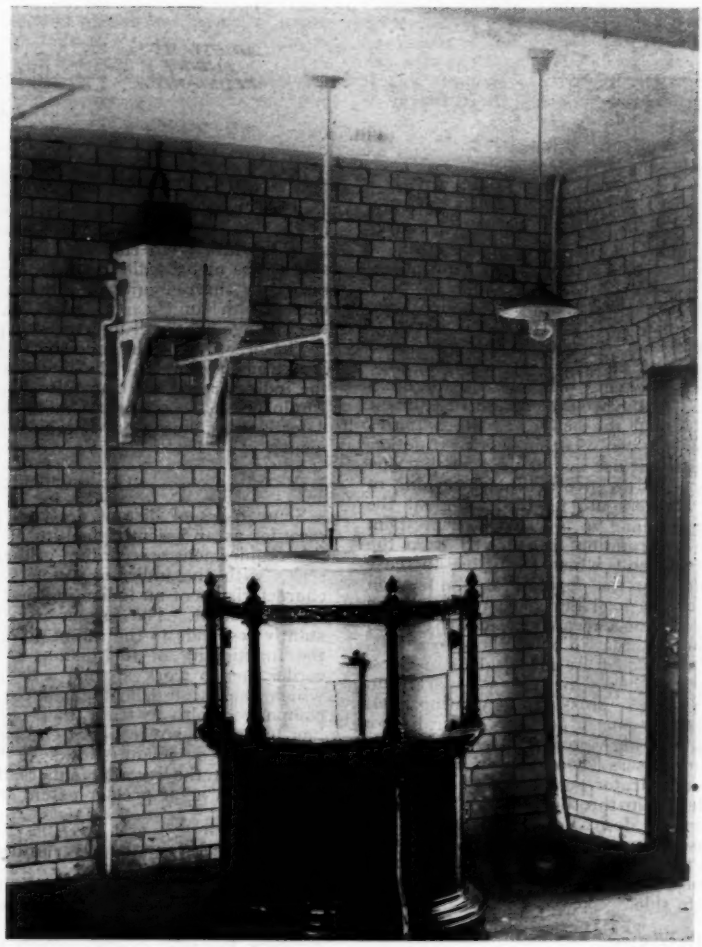


FIG. 3.

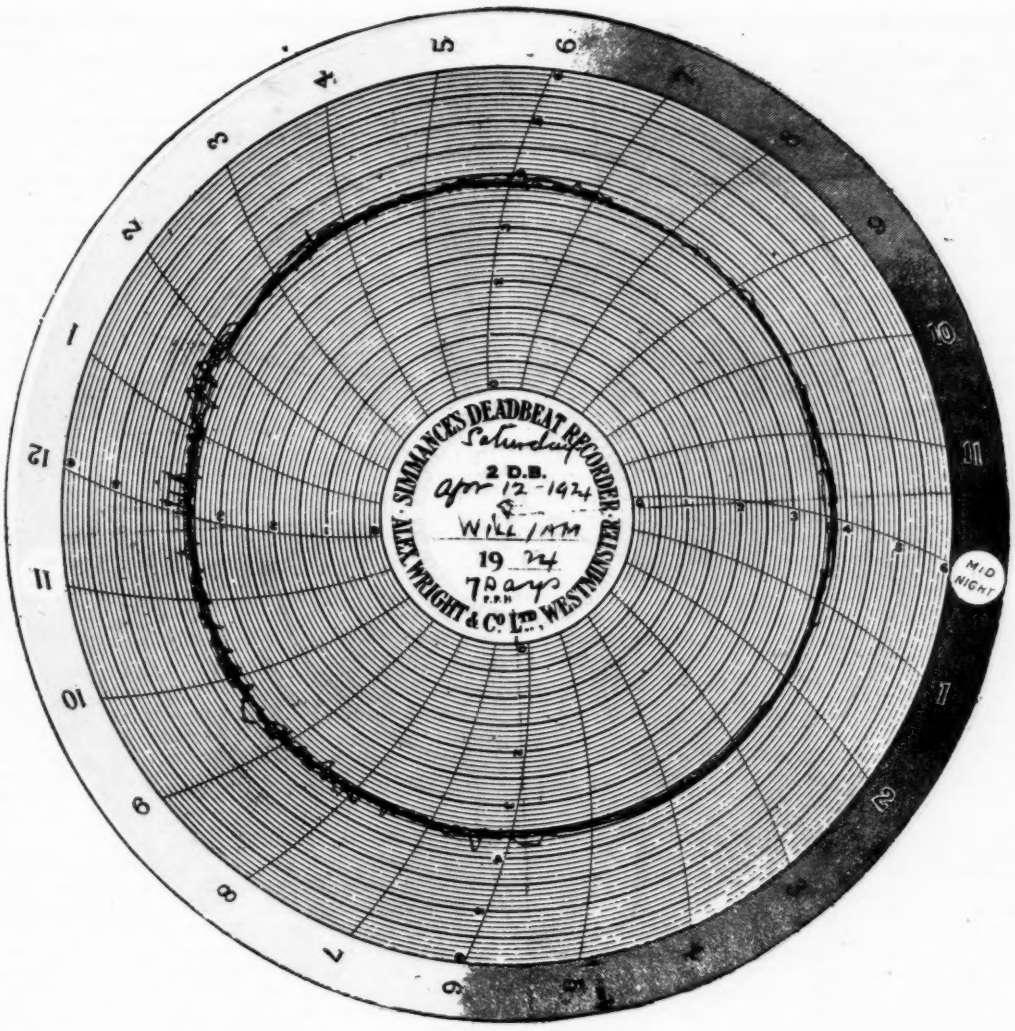


FIG. 4.

It may be interesting to mention that an experiment of deliberate neglect was tried on one of these instruments, and it was found that it would work for about four months before the fouling of the mercury and the contacts were reflected in a loss of accuracy.

Siting the Transmitter.

The cylindrical transmitter is 12 in. in diameter by 24 in. high, and a top clearance of 12 in. is necessary in order to ensure the easy removal of the spider. Hence a box 18 in. square by 36 in. high is sufficient.

These boxes are often placed on private property (say, in a backyard or a garden) by arrangement with the owner, an acknowledgment of 10s. or 20s. a year being paid for the concession. Alternately, by arrangement with a local authority, they are often installed in a public thoroughfare, housed in a cast iron or a steel pillar, similar to a tramway section pillar. These boxes cost about £9, and should, as far as possible, be set back from the path of a skidding vehicle, as a collision does not exactly improve the working of the apparatus. The private site is to be preferred, as the instrument is naturally more sheltered, and there are less difficulties in arranging for the entry of the leased circuit.

Governor pits are rarely used for housing the apparatus, but there is no reason why it should not work well in a well drained and well ventilated pit. Before a site is definitely chosen, it is obvious that the G.P.O. Telephone Department should be asked if they are prepared to take the circuit into the proposed site.

Cost of Distant Pressure Indicator Service.

The cost of the service afforded by a distant pressure indicator cannot be shown better than by taking the typical case of an instrument situated three radial miles from the works.

The annual charge to be met will be as follows :

	£	s.	d.
Circuit rental, 3 miles at £8.	24	0	0
Capital charge, say	5	0	0
Attendance charge (1 hour per month, including travelling time)	0	18	0
	£29	18	0

In this case it should be noted that a weekly expenditure of 12s. keeps the works staff continually informed as to the pressure condition prevailing at the three-mile distant point.

To compare this system with the service reported over the telephone by district pressure takers, it is only necessary to ask oneself how many reports could be obtained for 12s. a week.

Automatic Pressure Control.

An automatic pressure control system is associated with these distant pressure indicators for the purpose of maintaining, automatically, an unvarying pressure at that point on the distant district where the transmitter is situated. The apparatus comprises an ordinary distant pressure indicator which includes in its circuit a sensitive relay shown on the left-hand panel in fig. 1. This relay controls a local circuit, but, so long as the indicating current is flowing in the system, the tongue of the relay is held in the "open" circuit position. The contact needles in the distant transmitter are so adjusted that when the pressure falls below the predetermined value at which it is desired to keep the pressure, the indicating current is broken and the tongue of the relay at the works end falls to the "closed" circuit position. A flow of current is established through a tank mounted, solenoid operated, valve, and water flows rapidly into the loading tank of the adjacent district governor, fig. 3. Under this rapid loading, the pressure at the distant point quickly rises, the indicating circuit is automatically restored, and the tongue of the relay opens the local circuit, causing the flow of water into the loading tank to cease. The run-off at the side of the tank is set to allow a small trickle of water to leave continuously, so that the pressure is always being reduced to that point at which the cycle is repeated, and rapid loading again takes place. In practice this method keeps a straight pressure line at the district point, as shown on the chart in fig. 4. This chart is of peculiar interest, inasmuch as it is a 24-hour chart which has, for purposes of economy, been kept on the recorder for a week. There are seven distinct lines on it, and it will be noted that these lines combine to form a ragged circle. Fig. 5 shows a typical chart from this same point taken before the installation of the automatic control system.

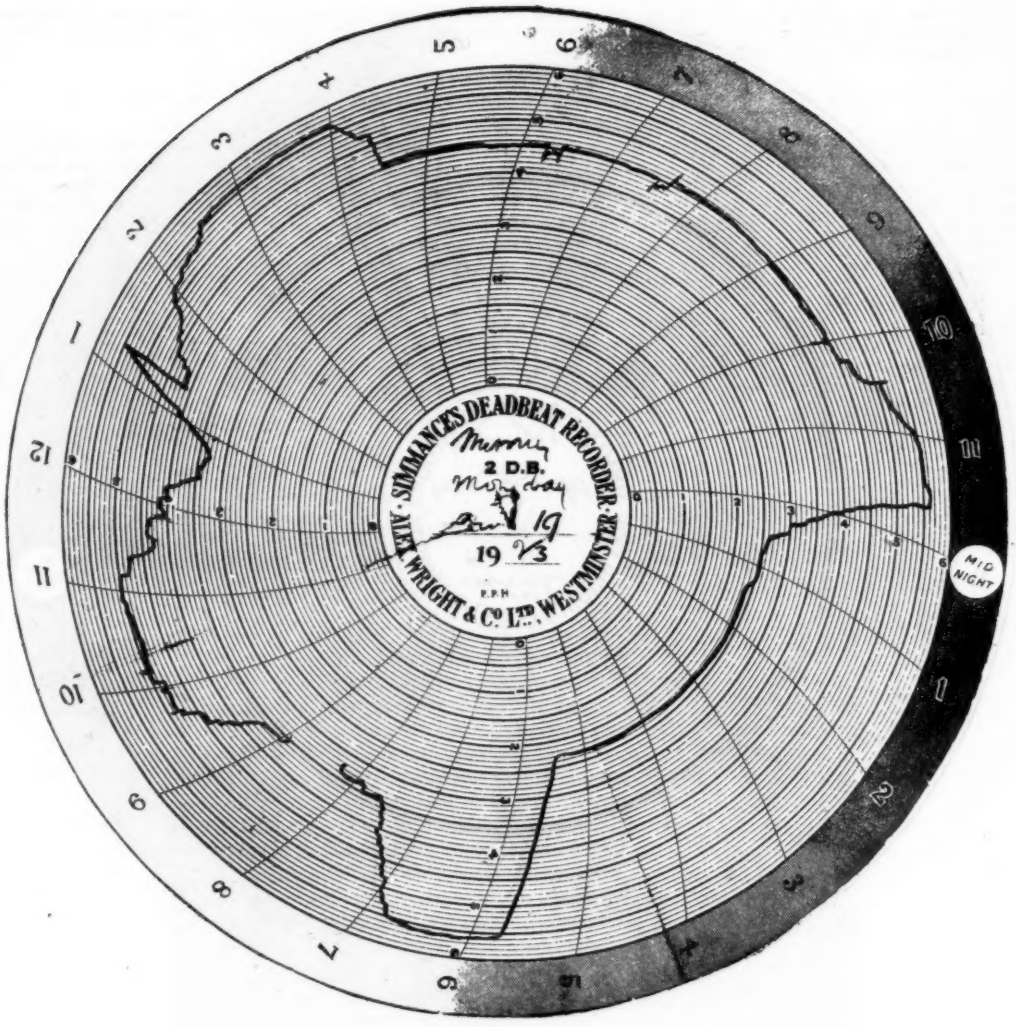


FIG. 5.

The frequency with which the above-described cycle takes place depends upon the variations in demand. On a sharply rising demand it operates frequently, but at times when the pull on the main is stabilized it takes place only at long intervals. Where it is desired regularly to change the pressure at different times of the day, additional contacts can be fitted to the transmitter, the control being transferred to the desired contact at the proper time by a time switch.

The question as to when it is, or is not, desirable to install this automatic feature depends entirely upon the characteristics of the district to be controlled, and upon the labour arrangements at the works end. Where a regular pressure attendant is always on duty in the governor house the advantages of this automatic system are obviously not so great as where the man responsible for the loading of the governors has other duties which must take him away from the vicinity of the governors. Where district conditions are such as to require frequent alterations in the maintained pressures, there is no case for the use of the automatic attachment, which literally ties the pressure at the distant point to a predetermined figure. This attachment must only be used on an individual main, and district interconnections are prejudicial to its proper functioning. In such cases the governor worked under automatic control becomes a pilot governor, and does its best to take control of the entire interconnected district to the limits of its capacity. The use of a distant pressure indicator always turns out to be a profitable proposition, irrespective of district conditions, but the automatic attachment is designed against a definite duty, and its use requires careful consideration. The two systems are not interdependent, and it is easily possible, if necessary, to cut out the automatic feature, and use the installation as a distant pressure indicator pure and simple.

This system is extremely easy, and requires no more attention to keep it in working order than does the ordinary distant pressure indicator.

While on the subject of automatic pressure control, it may be interesting to indicate briefly the possibilities of automatic working in association with distant pressure indicators. In the system just described, the failure of the indicating current causes the operation of a solenoid-operated valve. In the same way, and by substantially the same apparatus, it would be possible to start up an electrically driven compressor whenever the distant pressure fell to a set minimum, and to stop it automatically when the pressure at the distant point rose to a set maximum. On such an installation, the compressor would be working intermittently under automatic control, and the pressure at the distant point would be always rising and falling between predetermined limits.

In the same way, using a distant holder height indicator, a compressor could be automatically worked, stopping and starting according to the maximum and minimum positions of the lifts.

Automatic control has to-day attained a high pitch of perfection, and from the technical point of view there are many functions pertaining to gas supply which could be accomplished in an entirely automatic manner. I am not prepared to say how far it is wise or expedient to go in this direction, and every case has to be considered on its individual merits; but the foregoing remarks indicate the possibilities of such systems when once a definite control circuit has been established between the works and the district.

Remote Control.

In many cases it may be profitable to install remote control systems for purposes which for many reasons it may not be wise to trust to automatic control. For instance, at Plymouth there is a water-loaded governor situated some 1½ miles from the works. Owing to district conditions it is required to load and unload this governor so frequently as to require, in days gone by, the frequent visits of an attendant. A leased circuit is established between the works and the distant governor house, and by a system of remote (not automatic) control the works attendant can load and unload the distant governor according to the demands of the district.

The system works with a common earth return, one limb

of the leased circuit being used for loading and the other limb for unloading.

At the control panel, two meters, scaled thus:

LIMIT — LOAD — UNLOAD — CONTROL

are fitted. One is connected in the "load" and the other in the "unload" line. If the attendant moves the control switch to "load," the meter in that circuit will indicate "load" immediately the loading valve lifts. If that valve failed to lift, the meter would fail to indicate "load," and the faulting of the device would be automatically indicated. In the same way the meter in the unloading circuit registers "unload" when the control switch has been put to that position, and only so registers if the unloading valve actually lifts.

If the line for any reason became cross-connected, the meters would contradict the control switch, and when the switch was set to "load" would indicate "unload," and *vice versâ*.

Should either meter swing and remain at the "control" position, it is automatically indicated that, while the control circuit has been established, the distant local circuit has failed to function.

The "limit" mark on each meter indicates to the attendant that the distant governor bell is nearing the end of its vertical movement, being nearly up or nearly down, according to the meter on which that indication is shown. This may be described as a repeater system, in which the attendant receives a signal that the distant apparatus has responded correctly to his manipulation of the control switch.

Generally speaking, any system of remote or automatic control is weak or strong according to whether the working of the distant apparatus has to be taken for granted or, alternately, its proper functioning or failure to function can be immediately noted.

Any mechanical or electrical device, however well designed and constructed, is liable to failure, and the main issue on which an apparently suitable automatic or remote control system should be judged is the ease and rapidity with which a failure to function can be perceived.

In these matters it does not do to take things for granted, and some form of confirmatory signalling is an essential feature.

Earth Return Working.

This term refers to the practice of using the general mass of the ground for one limb of the circuit, the apparatus at the ends of the line being suitably earthed.

The advantages of this system are as follows:

(*a*) On a long line it permits of the two conductors of the leased circuit being connected in parallel, thus lowering the resistance of the circuit and greatly reducing the number of cells required to work the instrument.

(*b*) It enables one side of the leased circuit to be used for normal working, with the other side held in reserve as a spare line.

(*c*) It allows for two instruments being worked over a single leased circuit.

It should be noted that the circuit accommodation offered under the General Post Office £8 per radial mile tariff always consists of a pair of wires, and it is open to the renter to use those wires as he thinks fit, always subject to certain limitations as to loading. The point is that one can rent a circuit but not a single wire. The chief drawback to working with an earthed return is the possibility of interference by vagrant currents.

I would point out that a gas main used as one limb of a distant signalling circuit is virtually an earthed return, inasmuch as the main is not insulated from the general mass of the ground, and offers an accommodating path to any vagrant currents.

These currents arise chiefly from the working of street tramway systems, due to the impossibility of confining the whole of the return current to the track. A portion of this current (rarely less than 10 p.ct. and generally much more) will leave the track temporarily to flow through and between such gas and water mains as may offer alternative paths of low resistance.

These flows are particularly noticeable in mains running parallel to the track, and in districts laying between divergent tramway routes. They vary in value according to the hour of the day and the traffic on the system, and seriously interfere with the functioning of any signalling system using the ground as a return path.

For this reason, earthed return systems are often inoperable across districts served by street tramway systems, and the full insulated loop is used. No hard and fast ruling on this point can be laid down, as so much depends upon whether the area between the transmitter and the indicator happens to offer any inducement to the flow of vagrant currents. At Plymouth, for instance, four district pressure indicators have to be kept on loop lines, while two others, radiating in another direction have always been worked quite satisfactorily with an earthed return.

In connection with bulk supples to distant unattended holders, the advantages of an earthed return system will be obvious, as it enables a full-scale holder height indicator, and a distant pressure indicator to be worked on a single leased circuit.

In districts where there is no tramway system it can be taken for granted that earthed returns can be worked, but when this is not the case only an actual test will serve to determine whether or not this system can be used.

Conclusion.

The rapid growth of suburban areas and the consequent enlargement of the district of supply compel the modern engineer to form views and adopt practices which would have found little favour with an older generation.

In days gone by most districts could be supplied by holder pressure, and the distribution of gas could almost be described as a static process, inasmuch as it did not call for the employment of running plant. To-day, however, we are dependent to an ever-increasing extent on power driven plant in order to effect delivery to our consumers, and unless this plant is scientifically controlled there is a danger of power charges featuring too largely in the costs of distribution, to say nothing of the risk to which undue reliance upon the individual judgment of operatives always gives birth.

To many engineers, happy in the control of a favourably situated works in a well-balanced district, the apparatus I have described to you may appear complicated and unnecessary, but it has been evolved in response to a definite demand, it is widely used, and is childishly simple by comparison with the methods which the natural growth of the industry will eventually render necessary.

Purification of Town Gas by Means of Oxide of Iron*

By J. Dreverman, of Sydney

Subject to the gas being reasonably free from those impurities which should be removed by the condensers, tar extractors, and washers, the principal factors governing the practical purification of gas by means of oxide of iron are:

(1) The activity of the oxide for the absorption of sulphuretted hydrogen.
(2) The physical state of the oxide.
(3) The concentration of the sulphuretted hydrogen in the gas.
(4) The velocity of the gas.
(5) The time factor for chemical reaction.
(6) The design and economical number of boxes.

In practice, oxide of iron is applied in either of two ways for purification purposes:

(1) Mixed with water in the form of a slurry, which is circulated through tower scrubbers by means of pumps, so that the descending oxide comes into contact with the ascending stream of gas. The revivification of the oxide is carried out by circulating the used oxide slurry down towers through which air is blown.

(2) As a relatively dry spongy mass, standing on grids, in covered purifier boxes through which the gas is passed.

The first system has been successfully used in America for some years, but owing to the necessity of installing safety boxes similar to those of the second system after and in series with the liquid system it has not been considered sufficiently fool-proof by gas companies, and has, I believe, only been operated, for other than experimental purposes, at coke oven installations.

The second, or dry oxide of iron purification system, is of most interest to us locally since it has been generally adopted throughout Australia on account of its reliability and simplicity, hence it is my intention to consider in these few notes only particulars of the operating conditions of this system, without going into the chemical details.

The selection of a suitable oxide for use in the purifiers is most important and the choice from those available should depend on:

(1) The activity or rapidity and capacity for the absorption of sulphuretted hydrogen.
(2) The physical characteristics of the material.

The Kumberger fouling test, as adopted by W. A. Dunkley

* From a paper before the Australian Gas Institute at the Fourth Annual Convention, November, 1930.

in his report on "The conditions affecting the usefulness of oxide of iron for city gas purification," in which 4-5 grammes of the oxide is mixed with 2 grammes of coarse sawdust and fouled with pure sulphuretted hydrogen, is convenient, and gives the relative characteristics of the samples. Admittedly it is not the same as fouling oxide with crude gas on a large scale, but it gives the sulphur value, which, after all, is of most practical importance.

The classes of oxide which are available for purification are:

(*a*) Natural oxides, which includes bog iron and degraded iron ores, such as Port Macquarie oxide.

(*b*) Precipitated oxides which are precipitated from solutions, such as "Lux," a bye-product of the bauxite industry.

(*c*) Rust oxides which are made by corroding iron borings and filings with rusting solutions such as ammonium chloride.

(*d*) Pyrite cinders or residues which remain on burning pyrites for the recovery of sulphur in the manufacture of sulphuric acid.

Some years ago, when oxides of variable practical value were being received at the Mortlake works, many samples were tested to ascertain if the most satisfactory material was being obtained. It was found that the suppliers, under the impression that the higher iron concentration oxides were the better for the absorption of sulphuretted hydrogen, were actually supplying an inferior quality.

As a general indication of the results obtained, the analysis and relative sulphuretted hydrogen values of a few typical samples from the Port Macquarie field of natural oxide of iron are given in Table 1.

TABLE 1.

—	(1).	(2).	(3).	(4).
Analysis, &c. (dry basis)—				
P.ct. iron	53·9	48·20	43·50	39·00
,, iron as Fe_2O_3	77·0	68·31	62·10	55·70
,, loss on ignition	3·9	5·40	8·40	6·50
,, insoluble in acid	9·2	9·80	5·80	18·30
Grade of sample—				
P.ct. passing 200 mesh sieve on mixing into a slurry with water.	65	76	84	82
,, held on 10 mesh sieve	15	6	3	4
,, held on 40 mesh sieve	20	10	10	8
,, held on 200 mesh sieve	35	24	16	18
Relative activity of sample for absorption of sulphuretted hydrogen—				
Sample as received	67	83	100	100
After grinding to pass 200 mesh sieve	79	90	112	104

For practical purposes the results showed that there were considerable differences in the physical and chemical properties of the many samples tested, and that, of two samples having the same chemical analysis, that which was readily converted into a slurry with water was the more active, and, further, that those samples of Port Macquarie oxide containing over 52 p.ct. of iron had lower values than those of 38·52 p.ct.

Following the investigation into the selection of the most suitable oxide, a specification for natural oxide, indicating the iron content, loss on ignition, and fineness was adopted; and it is on that basis that supplies at Mortlake have since been obtained.

During late years many samples of oxide have been submitted by prospective suppliers, and purifying materials used in England and elsewhere have been obtained.

Table 2 is a comparison of the various samples and Port Macquarie oxide, which has been used at Mortlake for some years.

From the table it will be seen that Port Macquarie oxide compares most favourably with other samples included in the list, particularly in regard to fineness and iron content. Of the samples obtained from abroad, the "Lux" and north-east bog ore appear to be the most efficient, though the cost of importing the former would be more than three times the latter and six times that of our local material. As in England "Lux" containing from 70 p.ct. to 80 p.ct. of ferric oxide is sold for purification purposes it will be seen that the analysis of the sample included in the above table suggests that it may be of inferior quality, and that the first grade material would have about 25 p.ct. greater activity than our local natural oxide. In "Lux," the iron is in a very fine state of division as a precipitated ferric hydrate, and it contains such a high percentage of water that under a slight pressure in a mortar it readily forms a paste.

From the results obtained in the above table it may be stated that in Sydney we have, almost at our door (Port Macquarie), a large deposit of most suitable gas-works purifying material.

Naturally economic conditions must prevail in the selection of any oxide for individual works, hence it is not reasonable to state that any one class of material should be generally used.

As the economic value of an oxide on a gas-works depends upon the quantity of impurity it will remove from the gas relative to its cost, in some districts it is more economical, on account of freights amounting to 2-3 times the initial value of the better material, to use an inferior local one. In these cases it may be accepted that, where a selection is possible, it is better to use an oxide containing the greater percentage of hydrated ferric oxide or that having the higher loss of ignition or burning after drying at 100° C., and which is relatively soft and easily reduced to a finely divided state rather than one containing considerably more iron oxide.

Having selected the most economically active oxide for local use, care should be taken to render its physical state such that it can be used to the best advantage.

The law of mass action states that the rate of chemical reaction is proportional to the product of the weights of reacting substances present. It will be seen, therefore, that the rate at which the impurities are removed from the gas as a result of chemical reaction will depend upon the surface of active oxide of iron exposed and to the resistance offered to the passage of the gas. Under operating conditions, back pressure will vary directly as the density of the mass; therefore the oxide should be used in as finely divided and porous state as consistent with practical working conditions.

Preparation of Oxide Mixtures.

Many products have been suggested for use in the preparation of new oxide mixtures—viz., sawdust, shavings, grain husks, fibre, cut-up straw, tan bark, and old oxide, &c. Sawdust is the product most commonly used, since it is usually available in large quantities at a relatively cheap rate; it should, however, be of the coarser soft wood variety rather than of fine hardwood. Soft-wood sawdust retains more moisture and has a higher oil absorption value than the harder sawdust, grain husks, or fibrous material; it is of relatively even size; and is the most suitable for mixing with oxide to give a porous mass. As a mixture containing sawdust comes into active operation in the purifiers it loses the bulk of its moisture and shrinks sufficiently to leave the oxide in the spongy state through which the gas can readily pass and yet offer a maximum surface of oxide to the gas. Shavings are too variable in size and length for convenient mixing with oxide, while grain husks and fibre have low absorption values and are not usually available in quantity at an economical rate, and must, like straw, be cut up for application, since the longer fibre materials would render the discharging of the boxes more difficult. Tan

TABLE 2.

Analysis, &c.		Port Macquarie. Natural Oxide of Iron.	Westbury, England. Ground Natural Oxide.	Desborough, England. Natural Oxide.	Desborough, England. Mixture. Bog Ore and Natural Oxide.	North East Dutch Bog Ore.	Natural Dutch. Oxide from Zeist, Holland.	"Lux."	Corroded Iron on Shavings.
Moisture in samples	p.ct.	13·8	5·36	4·77	28·66	39·77	3·5	46·15	4·17
Moisture standard for purchase	,,	5·0	15·0	5·00	28·00	45·00	15·0	46·15	5·00
Analysis: Dry Basis—									
Loss on ignition	,,	7·56	13·03	13·48	20·62	28·89	15·44	14·94	27·28
Iron soluble in acid	,,	41·32	38·16	37·30	32·98	39·76	46·16	35·71	47·92
Iron calculated as Fe_2O_3	,,	59·02	54·51	53·28	47·11	56·80	65·94	51·01	68·45
Fe_2O_3 + loss on ignition	,,	66·58	67·54	66·86	67·73	85·69	81·38	65·95	..
Insoluble in acid	,,	18·00	20·10	17·26	15·83	9·13	9·66	5·19	2·69
Fineness—Dry basis, passing 200 mesh sieve on mixing into a slurry with water	,,	85·00	31·50	44·20	41·60	42·60	36·00	100	..
Iron (Fe) per ton of oxide purchased	tons	0·392	0·324	0·354	0·237	0·219	0·392	0·192	0·455
Activity—dry basis—relative absorption of sulphuretted hydrogen (Kumberger test)	relative	100	53	19	32	91	55	83	73
Sulphuretted hydrogen value of oxide, as purchased (activity × p.ct. dry oxide in tons purchased)		100	47	19	24	53	49	40·7	69·3
Estimated cost per ton of oxide, delivered Sydney	,,	1	2·4	2·05	2·6	1·88	2·21	6·1	(?)

bark is inferior to the others mentioned in that it is generally too coarse, is acid, and is, as a rule, too costly. Used or partially spent oxide is mixed with the new oxide at many works, since it is recognized that alone the new material will not work satisfactorily when first used. Such mixtures can be relatively cheaply prepared for use, but their final economic values for the removal of impurities from the gas do not appear to be as satisfactory as other mixtures. As the used oxide may be already charged with impurities from the gas previously treated, it tends to yield a dense, heavy mixture which must be more costly to handle; it is not so satisfactory as sawdust where the latter is available in sufficient quantity at a reasonable rate. Admittedly the old oxide will prevent the hard caking of the new, but it does not retain sufficient moisture, which is so necessary to bring about the desirable chemical changes which take place when the boxes warm up on being put into commission.

No definite mixture can be recommended for all oxides used for purification, but within limits it pays to reduce the actual iron concentration of the natural oxide available locally. Oxide grows in use; in the early stages it does not expand laterally, but the individual grains, as a result of chemical change, increase in volume within the mass, and so fill up the void through which the gas normally passes. With use the oxides reach a maximum density, and abnormal temperature changes cause lateral expansion and often damage to boxes. Hence it will be seen that the initial density of the oxide mixture should be properly regulated to compensate for such possibilities.

To determine the relative values under laboratory conditions, a few 1/12 c.ft. mixtures of Port Macquarie oxide and sawdust, prepared by first mixing the oxide into a slurry and pouring over the sawdust, were placed in 12 in. high glass cylinders fitted as purifiers, and fouled with crude gas. Admittedly the results of fouling such test samples in a few days were not identical with the operation of large boxes in which the fouling may extend over periods of 6-9 months, but the results obtained indicate the necessity of properly preparing mixtures for use.

Per unit volume of purifier, considerably greater weights of sulphur were removed from the gas by the mixture containing appreciable sawdust. Under test, the 1 oxide to 3 sawdust mixture gave, per unit volume, the best results; but owing to the indication of short circuiting and relative lack of uniformity in sulphiding it did not appear to be so satisfactory for practical application as did the 1 volume of oxide to 2 of sawdust mixture.

To confirm the results, ½-ton sample mixtures were prepared by the more common method of turning over by means of shovels and wetting down with water to a desirable consistency for application in which all the sawdust was well coated with oxide. The ½-ton samples were placed in formings in working purifiers, of 7000 c.ft. capacity or holding 160 tons of oxide, during the normal filling operation.

The samples were removed when the boxes were taken out, and hence they were not of necessity completely fouled; but there was sufficient evidence to suggest that within the limit of the range of such mixtures it apparently pays to reduce the density of Port Macquarie oxide to approximately the 1 : 2 mixture. In the 1 : 3 mixture there was again a tendency for the uneven fouling, which was not apparent in the 1 : 1 and 1 : 2 mixtures. Where oxide of iron alone was used, only a few inches immediately above the grid was fouled, and it was particularly hard and stonelike, about 80 p.ct. of the depth of oxide appearing not to have done any work. Both the mixtures 1 : 1 and 1 : 2 worked well, though the latter did approximately 50 p.ct. more work than the former.

In the operation of large purifier boxes holding 4000 c.ft. of oxide, and larger ones such as at Mortlake, the practical advantages of increasing the quantities of impurities removed from the gas per unit volume of purifier are appreciable, and will be relative in small boxes. If filled with an unsuitable mixture a box of this size may hold 160-170 tons of oxide and remove only 10-20 tons of impurity before it must be taken out on account of back pressure; while with improved mixtures of a more practical density it will be necessary to handle 120 tons to remove over 100 tons of impurity by the same box per fouling. It may be stated that the latter mixture should be more easily taken out and disintegrated than the more dense oxides which become particularly hard and stonelike.

Times of Fouling.

Mr. G. C. Pearson, of Birmingham, in his notes on purification in the "Gas Journal" (June 12, 1929), indicates that at the Windsor Street Works the oxides are discharged from the boxes in the condition of high sulphur (50-60 p.ct.) content in one fouling, with the result that over half the revivifying ground area is dispensed with. Other engineers, many of whom use "Lux," claim that they completely foul their purifying material in one operation, which generally suggests that, as the local oxide available is very active, it should be possible to foul it completely in one operation—a result which suggests that the weight of impurity removed per box would be approximately that of twice the weight of mixture originally handled.

Many authorities recommend the careful preparation of oxide mixtures for purification purposes, and point out that the initially most expensive material may, if properly prepared, be easily the most economical. A number of synthetic products such as "Lux" have, during recent years, found great favour in England and on the Continent, and references clearly indicate that most satisfactory results can only be obtained when it is used with lightening materials such as sawdust or bog ore, which contains a large proportion of vegetable matter.

Tests as indicated in the Table 2, previously given, show that Port Macquarie natural oxide of iron compares most favourably with "Lux" for the absorption of sulphuretted hydrogen, though, on account of its fixed alkali content, "Lux" has the advantage of more effectively removing the cyanogen compounds, and according to reference is most efficient for the removal of H_2S with inlet gas temperature at 65° Fahr.

Dr. Weyman, W. A. Dunkley, and R. D. Leitch have demonstrated that the activity of an oxide is intimately connected with the oxide surface, while Dr. G. W. Anderson stated that the affinity for sulphuretted hydrogen is not proportional to the iron content but is largely influenced by the fine state of division of the iron oxide; hence it will be seen that "Lux," which is more or less of a paste, when properly mixed with sawdust, must offer an enormous surface of useful iron for purification—an advantage which is of no little consideration when comparing with other products.

Operation at Mortlake.

As a general rule boxes in which two or more layers of oxide are used are the most satisfactory. At Mortlake we have three types:

(1) Boxes holding from 80 to 120 tons of oxide in 1 layer
(2) " " " 140 " 160 " " " 2 layers
(3) " " " 140 " 160 " " " 3 "

The boxes containing one layer often remove as many tons of impurity on fouling as do those with two or more layers, but, on account of tar and oil passing forward in the system, the possible danger to considerable quantity of valuable oxide cannot be overlooked. The safer, more foolproof, and economical system of two or more layers has been generally adopted in all the extensions during late years.

It is interesting to note that C. G. Pearson, in discussing the Windsor Street Works at Birmingham, indicates that the dimensions of the boxes installed are practically the same as a number of those at Mortlake, and that 10-11 c.ft. of purifier space per 1000 c.ft. of gas appears to have been adopted in both cases, though at Birmingham the crude gas contains from 400-500 grains of sulphuretted hydrogen per 100 c.ft. of gas as against 180-230 at Sydney. Here, however, we find that in the more recent vertical gas purifiers, which are isolated from other sections on the works, 6·5-7 c.ft. of oxide volume per 1000 c.ft. of gas has proved satisfactory, though, on account of excessive tar fog at times passing forward and resultant excessive back pressures, the working periods of some of these boxes are considerably reduced.

In the latest carburetted water gas installation at Mortlake the purifier capacity, or total purifier volume provided, is equivalent to 8-9 c.ft. per 1000 c.ft. of gas, though, on account of the excessive quantity of tar fog passing forward in the gas, 25 p.ct. of the total capacity (or the bottom layer) is occupied by breeze. These purifiers actually contain 4 c.ft. of oxide per 1000 c.ft. of gas, and are working quite satisfactorily in series of three. As the carburetted water gas contains only 120-130 grains of sulphuretted hydrogen per 100 c.ft. of gas, or about half that in coal gas, the above may appear to be relative to the purifier volume generally required for coal gas; but the loss of over 25 p.ct. of the volume of the boxes intended for oxide, for the purpose of removing tar fog, which admittedly should be removed before the gas reaches the purifiers, does not appear to be economical.

The necessity of removing tar fog from the gas before it reaches the oxide boxes will be generally recognized, though the difficulty of removing it from vertical and carburetted water gas must not be overlooked. Horizontal gas contains less than 50 p.ct. that of the others, so that more precautions must be taken in the treatment of the latter. Tar fog from vertical gas is particularly damaging to oxide, which becomes coated with an impervious asphaltic coating that prevents further chemical reaction between the oxide and the impurities in the gas.

With the ordinary type of treatment, horizontal gas is readily reduced to a tar fog concentration of 2-10 grains per 100 c.ft., but the usual type of "P. & A." tar extractors have not been found efficient for the treatment of vertical and carburetted water gas, most authorities agreeing that the mechanically operated machines, among which the high-speed turbo-exhausters may be included, are most effective. With, however, the recent development and successful use of the Lodge-Cottrell electrostatic precipitator in England and America, an installation having a capacity to treat 8 million c.ft. of carburetted water gas per day has been erected at Mortlake. From the information available it is considered that with this installation, which efficiently operates at a temperature of 100° Fahr., the tar fog content, which often reaches 300 grains per 100 c.ft. of gas on the inlet of the purifiers, will be reduced to less than

10 grains. This result which must considerably affect the economical working capacity of the purifier boxes, and probably indicates that under our climatic conditions the volume of oxide required per 1000 c.ft. of gas treated may reasonably be reduced to about 4 c.ft., or less than half that generally recommended.

Tar Spraying in the Foul Main.

In addition to the adoption of the electrostatic precipitator, it might be mentioned that, though it is not generally considered necessary to wash or scrub carburetted water gas, on account of its only containing a few grains of ammonia, experience since operating the back-run process, which was put into commission in August, 1929, definitely indicates the desirability for some such provision before the inlet of the condensers when using the present gas-making oil. As an alternative, however, to installing the more expensive tower scrubber required for the treatment of 8 million c.ft. of gas per day, we have been successfully using a high-pressure crude tar spray in the foul gas main before the condensers. To date, it has not been necessary to operate the tar spray continuously, its operation for about eight hours per day having a most desirable effect. The atomized crude tar removes a considerable quantity of naphthalene and heavy oils which would otherwise deposit a thick emulsion inside the condenser tubes. It also breaks emulsions already formed in the tubes, and thus admits of their more efficient operation as a result of better thermal conductivity.

Successfully to operate the purifiers at Mortlake, which are run in series of three and four, it is found necessary to pass forward 10-20 grains of ammonia per 100 c.ft. of inlet to purifier gas, when in the outlet gas the ammonia may be kept below one grain.

All our purifiers are arranged for the gas to pass upwards and in forward rotation only; but I believe that, if the Lodge-Cottrell precipitator is as successful as is anticipated, the many advantages of the downward flow and backward rotation will be considered, along with other precipitator units to treat the whole of the gas made.

Oxide Temperatures.

Temperatures taken in tubes extending through the purifier covers of single-layer boxes indicated that the average working temperatures 12 in. above the grids varied from 125° to 130° Fahr., which was, on an average, 20° Fahr. above that of the gas as obtained in the outlet mains, where the radiation from the pipes appears to affect the temperature readings. These temperatures are well above that (70-80° Fahr.) which, according to references to British practice, is very suitable in the sulphiding zone, and approach that (in the neighbourhood of 140° Fahr.) which, the Alkali Inspector's report states, is most favourable to the maximum absorption of sulphuretted hydrogen. Our records indicate that a maximum temperature of 198° Fahr. in the oxide was obtained in the summer and 155° Fahr. during the winter period, while the minimum temperature of the oxide when it had to be removed solely on account of back pressure was 117° Fahr.

At Mortlake no special external measures are taken to warm the gas before entering the purifires, the increased temperatures being primarily due to the heat of chemical reaction

The heating of the gas prior to entering the purifiers has been under consideration, as an alternative to the passing forward of an excess of ammonia to increase the activity of the oxide; and now that the operation at Mortlake of an experimental gas-works plant having a capacity of 20,000 c.ft. of gas per hour is soon to be an accomplished fact, it is hoped that in the near future we shall have available more definite information as to the economical and practical aspects of such an installation. Personally I consider that the advantages of heating the gas on the inlet of purifiers will only be obtained on works where the crude gas is reasonably free from tar fog.

Fuel Research Board

Report for Year Ended March 31, 1930

The Department of Scientific and Industrial Research have published the Report of the Fuel Research Board for the year ended March 31, 1930, together with a Report by the Director of Fuel Research, Dr. C. H. Lander. This is obtainable at H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, and Branches, at the price of 2s. net.

In his report, the Chairman, Sir Richard Threlfall, observes that the stage now reached in the development of low-temperature carbonization appears no longer to justify the high degree of priority which has, up to date, been given at the Fuel Research Station to the development of full-size retorts for the low-temperature carbonization of coal, but there is still much to be done in other directions if the process is to live and gather momentum. One of the most pressing problems is the utilization, to the best advantage, of the tars, and increased priority is now being given to this problem. He goes on to state that the investigations on loss of heat from carbonizing settings have been fruitful of results, and that it is fair to claim that a realization of the avoidable loss of heat from vertical retorts as commonly erected, in particular that due to iron embedded in the setting, has resulted in savings by the carbonizing industries which more than cover the whole cost of the experiments, and that in a large measure this saving has been passed on to the consumer.

Very interesting are Sir Richard Threlfall's remarks on coke ovens. "We have long realized," he says, "the desirability of work of this nature (*i.e.*, carbonization in coke ovens), but owing to pressure of other work have not, up to the present, felt able to recommend that it should be undertaken at the Fuel Research Station. We now feel, however, that, in view of the stage reached in the other large-scale investigations, the time has arrived when a small setting of full-size experimental coke ovens should be erected at the Fuel Research Station, and we have accordingly recommended that this should be put in hand. We understand the proposal is still under consideration, as some questions have arisen as to the conditions of tenure of the site on which the Fuel Research Station is built. This question, and that of the provision of the necessary funds, must be decided before any actual start can be made with the erection of the plant."

Discussing this matter, Dr. Lander observes that the problems in the carbonization of coal are many and far reaching, and they cannot be divided into independent sections dealing with gas-works practice, coke oven practice and low-temperature practice, though these are the divisions which have obtained in industrial practice. The technical problems are fundamentally the same, and the trend of development is towards breaking down the distinction between these divisions in industry. He suggests that the trend of development points to the increasing use of ovens for gas making, and suggests that a free-burning coke for domestic use might also be more economically produced in this type of carbonizing plant.

Dr. Lander summarizes the work on the effect of the size of the coal charged to gas retorts (both vertical and horizontal) as follows:

Effect of Size and Nature of Coal in Vertical (Glover-West) Retorts.—(*a*) The ease of operation of the retorts is greatly increased by the use of sized coal.

(*b*) The use of large-sized coal prevents the carrying forward of dust into the collecting mains, &c., and the temperature of the ascension pipes is lower with large than with small coal.

(*c*) The amount of steam decomposed does not appear to be influenced by the size of the coal, but is influenced by the type of coal.

(*d*) The effect of size upon the yield of products is marked, except in the case of ammonia.

(*e*) The yield of coke increases with decreasing size of coal, and the difference between the yields with large and small coal amounts to about half-a-cwt. per ton of coal. The amount of coke breeze produced is increased appreciably only when using fine coal of the lowest caking power.

(*f*) A reduction in the size of the coal increases the strength of the coke (as indicated by the shatter test), and the magnitude of the effect increases with decreasing caking power of the coal.

(*g*) The volume of gas produced is increased by the use of large coal, the increase becoming more marked as the caking power of the coal increases. The increases in volume of gas produced are attended by lower calorific values. The thermal yield of gas from a strongly caking coal is increased considerably by excluding the fines from the retort; with a medium caking coal the thermal yield is little affected, the lower calorific value compensating for the higher volume. With a weakly caking coal the thermal yield is less with large than with small coal.

The specific gravity of the gas increases markedly as the caking power of the coal decreases, and is always lower with small coal than with sized coal of each type.

(*h*) The yields of tar are about 50 p.ct. greater with large coal than with small.

(*i*) By using sized coals it is possible to increase the throughput of the retorts. In the case of the particular retorts used with a normal throughput of 2·5 tons per day, the throughput was increased to 4 tons and over, though the resulting increase in the output of gas was not quite in the same proportion.

Effect of Size and Nature of Coal in Horizontal Retorts.—(*a*) No difficulty is introduced into the working of horizontal gas

retorts by the use of fine coal, and no advantage is gained by the use of sized coal.

(*b*) The effect of size on the yield of products is small, within the range covered by the experiments, when the throughput of the plant is maintained at the same rate.

(*c*) The use of fine coal increases the calorific value of the gas, decreases the volume, but increases the thermal yield; the variations are, however, very slight.

(*d*) The yield of tar is appreciably reduced when the voids between the particles of nut coal are filled with fine coal, the difference being about 10 p.ct. with strongly caking, and 24 p.ct. with weakly caking coal.

(*e*) The yields of ammonium sulphate are not appreciably affected by size of coal, but as the oxygen content of the coal increases so does the percentage of nitrogen converted to ammonia.

Comparison of Vertical and Horizontal Retorts.—The tests in the vertical retorts were carried out with steam injected into the retorts to the extent of 10 p.ct. by weight of the coal charged. The immediate comparisons given by these experiments are, therefore, confined to this amount of steaming. Subject to the above, and to the fact that the advantages to be gained from vertical retorts are only fully realized if sized coal is used, the comparisons are as follows:

(*a*) An increased thermal yield of gas up to 29 p.ct., can be obtained from vertical retorts, and an increased yield of tar, up to 24 or 48 p.ct., depending on the type of coal.

(*b*) The gas from vertical retorts has a lower calorific value, by from 70 to 120 B.Th.U. per c.ft., and a specific gravity higher by from 0·03 to 0·06.

(*c*) The coke from vertical retorts has a lower bulk density.

(*d*) The yield of ammonium sulphate is lower from vertical retorts, and the strength of the liquor is also lower.

(*e*) In horizontal retorts, the results are little affected by the size of the coal, and fine coal can be carbonized to advantage in this type, provided the fine coal does not contain too large a proportion of ash, or of non-caking constituents, as may be the tendency in some cases if a run-of-mine coal is divided by screening.

(*f*) With coals of low caking power, a denser and stronger coke can be obtained in horizontal retorts.

Work on horizontal retorts is dealt with by Dr. Lander at some length, particular mention being made of the results accruing from the use of a main damper in a setting of horizontals. This matter was discussed by Mr. G. Percival in a paper before the London and Southern District Junior Gas Association a year ago, and was fully reported in the "JOURNAL" for Feb. 5, 1930.

We have, of course, only selected for particular mention a few of the many subjects treated in this valuable report. Other questions considered include the analysis of coal, the microscopical examination of coal, the X-ray examination of coal, the assay of coal for carbonization purposes, the carbonization of coal in the form of fine particles, the propagation of a zone of combustion in powdered coal, the effects of pre-heating and oxidation of coal on its coking properties, the production and purification of water gas, the "shatter" test for coke, the "reactivity" of coke, and "combustibility" tests. There are sections on low-temperature carbonization, on pitch and briquetting, on the purification of coal, on hydrogenation, on domestic heating, on internal combustion engines, and on miscellaneous laboratory work.

Water Heating by Gas

The following is from the latest report of the American Gas Association Committee on Water Heating.

ECONOMIC FACTS IN SALES PROMOTION.

By H. E. DEXTER, of the Central Hudson Gas and Electric Corporation, Poughkeepsie, N.Y.

The water heating load, both residential and commercial, is vital to every gas company, and its progressive increase is always a matter of primary importance. The experience of gas companies whose success in this field has been outstanding indicates that the initial aim should be the providing of complete and continuous hot water supply, since any lesser step results in inadequate service for the consumer and in dividing with competition a service which can best be done entirely by gas.

The gas company looking towards this increase in gas load is faced by the apparently solid barrier of fact that even partial use of gas for water heating is not entirely accepted by the public, and the further fact that the cost of ownership and operation of self-action water heaters has, in the past, restricted their use to relatively a few people in the higher strata of income. The data which seem effectively to bar progress, however, often yield to a careful analysis of the finer details of fact. It is the purpose of this pamphlet to outline the actual details which appear to be essential to a complete understanding of the opportunities and possibilities in the gas water heating load.

The amount of business which may be added by means of gas water heating is dependent upon the following factors: (1) Market; (2) rate; (3) price of heater; (4) money available for promotion; and (5) organization.

MARKET.

A careful analysis of the market available for the sale of gas water heating will determine the type of activity as well as the extent of the sales to be expected. It should include the examination of the following data:

(1) Number of gas tank heaters.

(2) Number of automatic gas heaters.

(3) Number of residential consumers.

- (*a*) Families living in owned home.
- (*b*) Families living in apartments.
- (*c*) Families living in 2 or 3 family houses.

(4) Number of homes piped for hot water.

In addition to these essential facts, there are other important data which lead to a more thorough understanding of the whole situation, data which grow in importance as the more complete saturation of the market is reached.

The secondary, but highly important facts, are the following:

(1) Number of families in each of several income classes.

(2) Amount of money available in each of these income classes beyond that required for a minimum standard of living.

(3) General characteristics of people served by gas lines, including living habits.

RATE.

In determining the rate to be charged for gas used for automatic water heating, careful consideration must be given to the fact that gas must operate in competition with other fuels. An analysis of the market such as that sketched above will reveal the fact that many who use gas occasionally will also rely upon other fuels in connection with gas, such as water heating by coal through use of a furnace-coil or coal range waterback. While it is difficult, if not impossible, to educate the average householder away from such practices by logical means, it is nevertheless true that gas must be reduced in cost to the point where the householder will not consider himself too greatly penalized for the added convenience of gas as compared with other fuels. The composite experience of a great number of gas companies who have succeeded in the promotion of water heater sales indicates that gas for automatic water heating can only be sold in competition with other fuels when an inducement rate is available which averages not more than $1.25 per 1000 c.ft. for 537 B.Th.U. gas, for the gas which is used in water heating.

PRICE OF HEATER.

Next in importance among the factors controlling extensive water heater sales is the price of the heater to be sold. It may be assumed that a given amount of merchandizing effort, intelligently applied, will result in a fixed total of gross sales. While this fact is enough for the purely merchandizing organization, it is important for the gas service companies that this amount be split into as many units as possible, since it is the number of units and not the gross amount of sales which determines future revenue. This fact, of course, clearly indicates the necessity for a price as low as is consistent with satisfactory quality and freedom from unreasonably large service costs. A lower initial cost of the heater will also result in reaching lower strata of the market as revealed by the market analysis.

From the practical standpoint, it is also important to consider the psychological factor of the unwillingness of the average customer to add any large sum to the merchandizing account which appears on his monthly gas bill. Keeping the gas

bill within a figure which the average customer will consider reasonable can be done by any of three methods.

(*a*) Reducing the bill for gas.
(*b*) Extending the time for payment.
(*c*) Reducing the initial cost of the heater.

Obviously, a temporary gain in sales is not a sufficient reason for reducing the bill for gas, since this will result in a permanent impairment of earnings. Some gain in this respect can be made by extending the time for payment, but this is definitely limited by accepted principles of business practice. The third factor is, therefore, the most easily variable and should be carefully considered in view of recent advances by water heater manufacturers in the low-price field, and with a willingness to sacrifice immediate profits for ultimate gains.

Money Available for Promotion.

The willingness to accept some immediate sacrifice in order to build up a steady future revenue will also be a necessary factor in determining the money to be made available for promotion. The growing importance of intensively organized selling methods, including advertising, has necessitated such sacrifice in many lines of business and any new merchandizing enterprise will expect to invest for the promotion of sales, more than is warranted by early returns. In few other industries is the long-time return as completely assured as with the gas company, where normal use of the appliance will result in the revenue which is definitely ascertainable. It is not difficult, therefore, for the gas company to be forward-looking in the matter of promotional costs. The experience of merchandizing organizations in other fields handling products at the same stage of public acceptance, as well as the experience of gas companies which have successfully merchandized water heaters, indicates that the minimum amount of money necessary for successfully launching an activity on automatic water heaters appears to be the equivalent of one-half of one year's revenue from the gas used by the heater, in addition to the expenditure of what would normally be the merchandizing profit.

Organization.

With the market definitely determined, a suitable rate available, an appliance popularly priced, and a definite amount of money available for promotional work, the only factor remaining for consideration is that of the organization itself. The first problem of organization is, of course, that of supervision. Supervision for a special activity in water heater sales should be in the hands of men possessing more than the usual degree of those qualifications necessary for leadership. It is essential that they shall be able to secure from a sales organization a full day's work for every day that passes, and that they shall be able to appreciate the economic facts which are laid down here. In the present development of water heater sales by manufacturers, these qualities will be particularly required because the entire training, as well as the supervision of the sales organization, will doubtless be in the hands of the gas company's own supervisors.

As regards the quality of salesmanship, it goes without saying that a high type of salesman will be required. Leaving out of consideration the personal elements of selection, the quality will largely be determined by the compensation offered. This compensation should be such that the superior type of selling man will be able to earn as much or more by his efforts in selling continuous water heating service than he could earn by the same amount of effort expended in any other field.

Local advertising will also be a matter for consideration in developing the selling organization, the amount as well as the type of advertising depending upon the local conditions indicated by the analysis of the market.

A thorough understanding of the possibilities of this field of effort involves an appreciation of the facts regarding the fuel itself as well as those concerning the market available for its sale. The following analysis of gas as a fuel for water heating is, therefore, considered an essential element in such a study as this.

Why Gas is the Logical Fuel for Water Heating.

1. *Gas Heat Most Economical for Water Heating.*

When gas is available it is the most satisfactory (based upon the fact that a utility engaged in selling gas water heating must have competitive rates), most economical, efficient and reliable source of fuel for water heating. Higher heating efficiency is obtained from gas fuel than any other.

2. *Gas is Safe.*

Modern self-action water heaters are equipped with automatic controls and safety devices which make the appliance absolutely safe.

Storage of liquid fuel presents an explosion and fire hazard.

3. *Location.*

The heater can be removed to the basement where space is not at a premium.

4. *Rapid Recovery.*

Gas water heaters have a rapid recovery which reduces the size of the storage tank to a capacity just large enough to care for the largest single demand.

5. *Low Standby Losses.*

Standby losses can be reduced to a minimum due to small storage capacity of the heater made possible by its rapid recovery.

6. *Simple Controls.*

The automatic controls are reduced merely to a simple temperature control and do not require complicated off-peak controls, time controls, or extra metering equipment.

No other fuel is subject to a comparable degree of control.

7. *Reliability.*

Installation is simple, reliable, free from control devices which restrict the supply of hot water or which may fail in service.

8. *Economic Efficiencies.*

Gas—537 B.Th.U./c.ft. Heating efficiency—65-75 p.ct.—$1/1000 c.ft.

Coal—13,000 B.Th.U./lb. Heating efficiency—40-50 p.ct.—$14/net ton.

Oil—140,000 B.Th.U./gal. Heating efficiency—50-60 p.ct.—$0.09/gal.

9. *Labour Saving.*

Gas for water heating eliminates manual labour which is necessary for its chief competitor—namely, coal—although it need not cost more than coal.

10. *Cleanliness.*

Gas is the only *clean* fuel for water heating. (Note: Electricity is not, by strict definition, a fuel.)

11. *Longer Life.*

Because of controlled temperatures no strains are put on storage and piping systems. No liming or scaling condition is produced. Longer life of the system is obtained.

12. *No Fuel Storage Required.*

No investment in fuel is required. Gas is paid for when used. No space is required for fuel storage.

REPORT OF SUB-COMMITTEE ON SALES PROMOTION.

By M. M. Scott, of the Ruud Manufacturing Company, Pittsburgh, Pa.

There are many methods of selling automatic water heaters, but in general their fundamentals are the same.

This report deals with those fundamentals as reflected by a careful study of the 1930 sales plans of many gas companies. It attempts to present them in outline form so that they may be helpful in creating local plans to deal with local conditions.

Automatic Water Heaters—A Major Activity.

In any discussion of the automatic gas water heater, its proper place and relative importance in gas sales plans, these facts have been established:

(1) Sales pressure should be in proportion to the load-building characteristics of the appliance. The automatic water heater is a load-builder; it warrants a strong and continuous sales activity.

(2) It is saleable in that it is in the financial reach of the mass market. The first cost and cost of operation are in reasonable ratio to the service given and low enough to be attractive to practically all income strata.

(3) There is a universal need for hot water and a growing appreciation of an automatic supply. All factors considered, there is no doubt that for this service gas is superior to every other fuel. But the keen competition of other fuels demands a continuous offensive to retain old and create new customers.

(4) The market is broad. Types and sizes of automatic water heaters are made to meet the requirements of practically every building from the smallest cottage to the largest building.

Discussion of Direct and Indirect Sales Agencies.

The Executive.

One of the most encouraging things in water heater selling has been the growing interest on the part of executives and their more active participation in formation and operation of policies and plans. The importance of this should not be minimized. No opportunity should be lost to place before the executive all information concerning the revenue-making possibilities of the automatic water heater and its broad market.

Such co-operation should extend beyond a mere blanket indorsement, for it may be stated as a fact that investigation of

successful records generally discloses an active participation by executives, in one or all of the following ways:

(*a*) The appearance of the executive at general and special sales meetings; his water heater indorsement.

(*b*) Similar appearances before employee gatherings; his water heater indorsement.

(*c*) Letters on the subject of water heaters addressed to managers, sales managers, department heads, and general employees.

(*d*) A policy on water heater appropriations that is in harmony with the load-building potentiality.

(*e*) The use of an automatic water heater in his own home.

The Salesman.

The salesman is the contact man. In all speciality selling, no satisfactory substitute has ever been found for the man that actually calls on the prospect. Selection of salesman, compensation, training, direction, and stimulation are matters of first importance.

There is no universal prescription for the selection of salesmen and none is attempted here. Compensation has been covered in other reports, although it may be said in general that policies to-day lean toward a higher rate of pay for sales of load-building appliances.

Important factors as revealed by a study of many sales plans indicate that in training, direction, and stimulation of salesmen the following subjects are important:

(*a*) A thorough understanding of the company's general water heater policy.

(*b*) A knowledge of cash and deferred payment schedules, allowances, &c.

(*c*) Mechanical education with special emphasis on all types and their proper specification, sizing, local water and gas conditions, and the engineering superiorities of the units sold.

(*d*) The value of automatic hot water service in domestic, commercial, and industrial fields.

(*e*) Sales points of proved value.

(*f*) Common objections to automatic hot water service and their answers.

(*g*) Sales methods—how to find prospects, the best ways of canvassing, telephone work, how to use the user, &c.

(*h*) A knowledge of the company's policy of plumber co-operation.

Four methods are popular, any or all of which can be used:

A. The Sales Training Department.—Larger gas companies have created a sales training department to provide a systematic course of training for old and new salesmen.

B. Personal Contact.—Gas company sales officials—regular and special representatives of manufacturers can give invaluable help to the salesman.

C. Meetings.—Regular sales meetings are standard almost everywhere and are most successful when the programmes are so charted in advance that all sales factors are taken up in logical and definite order. Model sales interviews are popular; here one salesman takes the part of the salesman and another that of the prospect. Often the two participants are not selected until the last minute so that there may be no preparation. Prepared and impromptu talks by salesmen on various water heater subjects are of value. Manufacturer's representatives are available to give educational talks on sales and mechanical subjects.

D. Printed Matter.—Manufacturer's Literature: The manufacturer's educational literature should be given each man and periodical checks made to make sure that he has studied it. This is easily done by oral questions at sales meetings.

Manufacturer's House Organ: If the manufacturer publishes a sales house organ, each salesman should receive copies regularly. The best method (because of ordinary turnover in the sales organization) is to have a specified number of copies sent to the sales manager for mailing to the salesman's home or for personal distribution.

Local House Organ: Where the sales force is large enough to warrant, a multigraphed or mimeographed bulletin is a fine stimulator. It is particularly useful because it permits dealing with local problems and gives opportunity for personal mention of salesmen.

Contests: These will help to keep the salesman's interest. Often they can be built around local events; manufacturers also offer material of this nature. One large company has successfully organized a secret lodge for salesmen with degrees conferred at each meeting as a reward for good selling.

Prospect-Keeping: Special emphasis may be placed on water heaters by a job or day book in which a daily record of all water heater prospects is kept. This book is kept up-to-date by the salesman and is separate and distinct from the company's regular prospect system.

The General Employee.

The organization of all employees into an army of prospect-finders is now a general practice.

Properly handled, there is no more effective sales-help. In most cities, the number of gas company employees is larger than that of any retail establishment. Each employee is the centre of a large group of friends, acquaintances, and neighbours with whom he is often in contact under conditions that make it easy to explain the advantages of automatic hot water service. Where such interviews create interest, the names are given to the sales department for personal follow-up.

Four essentials of a co-operative employee plan are generally recognized.

(*a*) Financial reward for prospects registered that are sold. Common practice is to grade the bonuses in line with the revenue to be gained from the appliance.

(*b*) A system of prospect-keeping that eliminates mistakes in awarding bonuses.

(*c*) A rule that in no case is the employee to make size recommendations or quote prices.

(*d*) A special price of an automatic water heater for the employee's own home.

(*e*) Education of the employee on fundamental sales points.

Education of the employee so that he is able to tell a good sales story is of first importance. Unless he has an understanding of the value of automatic hot water service as contrasted with the shortcomings of other types of service and a belief that it is one of the most important of home utilities as contrasted with cold water service, the washing machine, the vacuum cleaner, the mechanical refrigerator, &c., he will not be getting the best results.

The employee should also be schooled in the simple mechanical features of the water heater featured. Two methods are usually followed:

A. By Meetings.—Large employee meetings have been successful at which talks by executives, playlets, &c., are featured. Some larger companies have created a special prospect department which keeps all employee records and contacts the employee personally.

B. By Printed Matter.—General Employee Publications: Space may properly be given in regular employee house organs to water heater sales points and the bonus plan. Several companies issue publications written exclusively in the interest of employee sales co-operation and this is perhaps the most effective method of keeping the proposition before them regularly. The publication may be printed, multigraphed, or mimeographed as circumstances dictate, but in any case, it is an ideal vehicle for employee sales propaganda. Some manufacturers will supply standard publications for employees with a space left blank for a local message to be imprinted. Placing of posters on bulletin boards is another method of reaching the employee. These may be printed inexpensively if cuts furnished by the American Gas Association Advertising Copy Service or those of the manufacturer are used. Then, too, almost every organization has an amateur artist who can draw timely cartoons to be reproduced on the mimeograph.

The Home Service Department.

There is no better agency for the public's education to higher hot water standards than the home service department. Their contact with the public permits a broad handling of the subject and an effective building up of a greater appreciation of automatic gas-heated water and a desire for it.

It is a matter of record that more home service departments are now giving more attention to hot water than ever before. The home service can help in many ways:

(*a*) In their home calls.

(*b*) In regular and special classes.

(*c*) In talks before women's clubs and other groups.

(*d*) In their publicity—radio, &c.

In all, a knowledge of hot water use and the water heater are essential, both of which can be supplied by personal instruction and printed matter. Sales executives and manufacturer's representatives can help by personal instruction, and manufacturers can generally supply helpful printed matter. The Cleanliness Institute is also in a position to supply valuable booklets and aid in research work.

The radio is a popular vehicle of home service departments. Some devote complete periods to hot water and others cleverly include hot water information in radio cooking lessons, &c. Hot water data may be made a part of recipe sheets, class announcements, letters, and other printed matter issued by home service departments.

Display.

Through the work of the American Gas Association Display Section, the manufacturers and other agencies, more interest is being taken in this method of publicity and with fine results.

Physical and Optical Societies' Exhibition

Excellent Demonstration by the Gas Light and Coke Company

The Research and Training Section of the Gas Light and Coke Company were again exhibitors at the Twenty-First Annual Exhibition of the Physical Society and the Optical Society at the Imperial College of Science and Technology, South Kensington, on Jan. 6, 7, and 8.

On the Gas Light and Coke Company's stand there were a number of examples of the research work carried out at Watson House. Among these was the test for ascertaining the resistance of pitch films, wrapped pipes, and wrapped joints. This is of interest as showing similar methods applied from the laboratory end and from the application end of the same problem. There was on view a simple gauge for carbon dioxide concentrations—a modification of Halden's taper to be used on the flue products from appliances—and also a simple colorimeter which has been developed in connection with the judging of the merits of daylight mantles.

Another apparatus was utilized to show the effect of water velocity, temperatures, surfaces, &c., on the deposition of scale, while there was also a simple apparatus for determining the coefficient of thermal conductivity of various commercial materials.

An Uninterruptable Tube.

Examples were to be seen of a new type of rubber tube, particularly useful for carrying gas in laboratory work, the supply of gas passing through which cannot be interrupted. This eliminates any risk should someone happen to tread on the tube or do anything else that might normally be expected to stop the flow of gas. The principle of this interesting exhibit, which is shortly going to be adopted generally, it is understood, by the Gas Light and Coke Company, embraces a small metal core passing through the centre of the tube, with the result that, should the tube be stepped upon, this core will prevent its being completely flattened out, always sufficient gas being enabled to pass through to keep any flame fed from the tube burning.

A further exhibit on the Gas Light and Coke Company's stand was an apparatus for measuring rubber permeability, while an interesting method was demonstrated of testing the quality of enamelled surfaces such as are used on gas cookers and gas appliances generally. These tests include an impact test in order to ascertain the strength of blow required to break or crack the enamel. A special arm graded in proportion to various weights and actuating from a central pivot is used for this test, and can be worked equally well upon a vertical or a horizontal surface. Other tests for enamel are the acid test and the abrasion test, whereby the surface is sprinkled with various hardnesses of powdered stone and rubbed over several times, the point being noticed at which the surface shows signs of scratching. These scratches are minutely examined under a microscope.

Wet and Dry Bulb Hygrometer.

In view of the present tendency for coal gas to be partially dehydrated before distribution—a system which the Gas Light and Coke Company are adopting generally at their works—the Company have designed a wet and dry bulb hygrometer, in combination with a slide-rule calculator to determine the dew-point of the gas. The gas is passed over the wet and dry bulbs at a predetermined rate, and readings of the two thermometers are taken, from which the dew-point is obtainable from the usual vapour formula. Many defects in the usual form of this type of hygrometer are eliminated, and the laborious calculations are simplified by means of the slide-rule, which is designed to give direct readings of the dew-point.

Velocity Effect of Flue Fittings.

Finally, there was an apparatus for indicating and gauging the air flow through flues, to determine the velocity effect of flue fittings, &c. Air only is used in this apparatus, heat in known quantity being supplied by triple nichrome wire grids arranged across an enlarged cylindrical portion of the base. The electrical input is, of course, under control. This heating portion is externally lagged, the heat loss from the outer casing being calculated, while the radiation loss downwards is picked up by a double-walled calorimeter, through which water is circulated. Air flow is gauged by temperature measurements at the adapter, a platinum resistance grid, thermocouples, and thermometers being utilized at different times for different reasons. Mean temperatures along the flue are gauged on platinum resistance grids, temperature reverse being carried out with copper-constantan couples. Rough calibration tests are carried out with an anemometer.

London Juniors at East Greenwich

On Saturday afternoon, Jan. 10, the London and Southern District Junior Gas Association, under the Presidency of Mr. T. H. Prater, of Margate, paid a visit to the East Greenwich Gas-Works of the South Metropolitan Gas Company, at the kind invitation of the Management.

The visitors were welcomed by the Works Manager, Mr. A. H. Andrews, and conducted over the works.

Description of Works.

These works have been described in detail on several occasions before in these columns, and a brief résumé of some of the principal points of interest inspected by the Association will be sufficient.

The East Greenwich Works are the largest of the South Metropolitan Gas Company, and occupy an area of approximately 150 acres. Straight coal gas only is manufactured, and the declared calorific value is 560 B.Th.U. Three-quarters of a million tons of Durham and Northumberland coal is carbonized annually, being delivered at the riverside jetty by the Company's fleet of coal ships and conveyed to the retort houses by steam locomotives.

Nos. 1, 2, 3, and 4 retort houses each contain 45 settings in three benches of 15 each, with ten horizontal retorts in a setting. The retorts are 20 ft. long and of oval cross section 21 in. by 15 in. inside dimensions. The aggregate capacity of the four houses is approximately 180,000 therms per day. One step grate producer supplies gas for heating three settings. No. 5 retort house contains 12 settings of ten 25-in. by 15-in. retorts and one bench of 28 settings each containing eight 25-in. by 15-in. retorts. The latter bench is provided with a set of four external producers, and in this section main arches are dispensed with. Arrol-Foulis chargers and Hunter-Barnett dischargers are employed, all being actuated by hydraulic power. The charging time is thirty seconds and the discharging time twenty-five seconds; each charge consists of about 12 cwt. (14 cwt. in No. 5 retort house), and the duration of carbonization is normally ten hours.

Coke is received in hydraulic quenching machines and afterwards discharged down inclined shoots. Wagons then convey it to the coke-handling and storage plants. Large coke is graded in the coke grading plant, capable of dealing with 500 tons per day. The coke breaking plant has a capacity of 700 tons per day. Overhead storage bunkers constructed of reinforced concrete and holding 4200 tons of coke are situated near the main entrance to the works and ensure speedy loading to road vans and railways wagons.

The exhausting plant consists of sixteen Bryan-Donkin exhausters driven by eight Farey type compound horizontal steam engines. The steam supplied to exhauster engines and the adjacent hydraulic pumping engines is provided by 10 Lancashire boilers 8 ft. by 27 ft.

Purification System.

Purification is carried out in six separate parallel streams interconnected at various points. This is probably a unique system of purification and created much interest. The principle was described in detail in the "Journal" for July 9, 1930 (p. 93), on the occasion of the visit of the Wales and Monmouthshire Junior Gas Association to East Greenwich on July 3 last.

The naphthalene extraction plant consists of six rotary washer-scrubbers having a total capacity of 300,000 therms per 24 hours. The anthracene oil used is prepared at the Company's Tar Works at Ordnance Wharf, and it is returned there

for regeneration after use. Pressure-raising fans are provided on each stream to overcome the back pressure of the gasholders.

There are twelve station meters which are sunk in concrete tanks below ground level to minimize effects of variations in atmospheric temperature. The two gasholders are of 45,200 therms and 67,200 therms capacity respectively. At the holder outlets, a number of gas-engine driven boosters are installed, the aggregate brake horse power being 620.

Finally, two trunk mains of 48 in. diameter connect the works to the other stations of the Company. The works are adequately equipped with machine tool, boiler, riveting, blacksmiths', painters', carpenters', and other shops. Another feature of interest is the reinforced concrete reservoir of 3 million gallons capacity, in which water for works use is stored. The old Blackwall Point Dry Dock was converted for this purpose.

After the tour of inspection, the Association were entertained at tea at the invitation of the Company, Mr. E. V. Evans, Joint Manager of the Company, presiding.

Mr. PRATER remarked that it was four years since the London and Southern District Junior Gas Association had had the privilege of visiting these works. During that period they had all noticed that the South Metropolitan Gas Company had patronized neither vertical retorts nor carburetted water gas plant. In the minds of most Juniors that policy might be difficult to understand; in fact, it gave one the impression on the surface of being a conservative policy. But they should realize the results put forward by the South Metropolitan Gas Company. Before he had arrived there he had looked into the annual reports of the Suburban Companies, published in the Technical Press, and one of the points in which he was always particularly interested was the number of therms obtained by this Company from their coal. This always appeared to be a very high figure. When they considered that the calorific value of the gas was 560 B.Th.U., the results gave one much food for thought. There was not a vertical retort installation in the vicinity of London, said Mr. Prater, to show figures like those of the South Metropolitan Company. The character of the coal was such that in the method of carbonization the amount of breeze was phenomenally small. Again, the amount received from sales of coke was higher than the cost of the coal.

Mr. J. M. WEBBER (Croydon) proposed, and Mr. G. PERCIVAL (of the Fuel Research Station) seconded, a very hearty vote of thanks to the South Metropolitan Gas Company for their hospitality and the facilities offered for visiting these works.

Mr. EVANS (Joint Manager of the Company), acknowledging the vote of thanks, said that they had received instructions from the Directors to provide all possible facilities for technical associations to visit their works; and this was especially applicable to the Junior Associations. Their President had referred to the works results. When a ton of coal went into their works it was their duty to get as large a yield of products from it as they possibly could. They had about 300 therms in every ton of coal entering the works, and of that quantity 200 therms would be coke, leaving 100 of what they termed "volatile" therms; and according to whether horizontal retorts, vertical retorts, or coke ovens were utilized, so these 100 remaining therms were divided up into various amounts of gas and tar. Vertical retorts were not such effective cracking retorts as horizontals. One obtained a higher thermal yield of tar but not such a high yield of gas. The East Greenwich Works had obtained about 70 therms per ton of gas and 18 therms of tar; in verticals there would have been a higher yield of tar and less gas. In conclusion, Mr. Evans said that the right-hand man of the engineer in any works should be the chemist. He was responsible for the yield and quality of the three products—gas, coke, and tar. If the products were not of the correct quality, the engineer directed the chemist to put it right. The chemist, in fact, became an integral part of the works management. The engineers were justly proud of their works and proud to show them to technical associations.

Parliamentary Bills for 1931 Session

Main Provisions of Measures Relating to Gas

(Continued from p. 46.)

Lowestoft Water and Gas Company.

This is a Bill to empower the Company to acquire further lands not exceeding 20 acres, of which not more than 5 acres shall be for the purposes of the gas undertaking. The Company's area for the supply of gas is extended to include the parishes of Hopton, Corton, Flixton, and Blundeston, in the County of East Suffolk. The Company are empowered to charge within this added area a price not more than 2·4d. per therm above the price charged in the existing area. A number of modern conditions relating to gas undertakings are included in the Bill.

The first preference stock of the Company (£34,375) and the second preference stock (£52,500) are converted into consolidated preference stock, bearing a maximum dividend of 4 p.ct., at the rate of £100 of consolidated stock for each £100 of existing stock. The Company are authorized to borrow on mortgage up to a limit of £165,662, or to an amount not exceeding one-half of the paid-up capital. Provision is made for the redemption of redeemable preference shares or stock and debenture stock. The Company may set aside an amount not exceeding £1000 per annum for a capital redemption fund. The amount of any contingency fund is limited to 10 p.ct. of the capital, and the sum which may be carried to it in any year is limited to 1 p.ct. of the capital. Separate accounts are to be kept for the gas and water undertakings. Any urban or rural district council wholly or partly within the Company's limits is empowered to enter into a guarantee or contract in respect of gas for public lighting purposes.

[*Parliamentary Agents: Messrs. Sherwood & Co.*]

Royston and Brodsworth Gas.

The objects of this Bill are to provide for amalgamation of the undertakings of the Brodsworth and District Gas Company, the South Elmsall and District Gas Company, and the Royston (Yorks.) and District Gas Company, Ltd.; to incorporate and confer powers on the Royston and Brodsworth Gas Company, and invest in that Company the amalgamated undertakings; and for other purposes.

The Preamble sets out that it would be to the public and local advantage, and in the interests of gas consumers, that the three undertakings should be amalgamated and their powers extended to adjacent areas. The Bill accordingly provides for the dissolution of the three Companies and their incorporation in a new Company under the title of the Royston and Brodsworth Gas Company. The capital of the new Company is to be £200,000, of which £194,607 18s. 4d. is original capital in substitution for the existing share and preference capital of the three Companies, and £5392 1s. 8d. is additional capital. Of the original capital, £171,807 18s. 4d. is ordinary stock and £22,800 is 6 p.ct. preference stock. Provision is made for the exchange of existing shares and stock on the following basis:

Brodsworth Company.

For each original ordinary £1 share, £1 1s. 8d. of ordinary stock. For each additional ordinary £1 share, 15s. 2d. of ordinary stock. For each 6 p.ct. preference £1 share, £1 of 6 p.ct. preference stock. For each 7 p.ct. preference £1 share, £1 3s. 4d. of 6 p.ct. preference stock.

South Elmsall Company.

For each original 10 p.ct. ordinary £5 share, £6 15s. 5d. of ordinary stock. For each original 8 p.ct. ordinary £5 share, £5 8s. 4d. of ordinary stock. For each additional 7 p.ct. preference £5 share, £5 16s. 8d. of 6 p.ct. preference stock.

Royston Company.

For each ordinary £1 share, £2 2s. 6d. of ordinary stock.

The Bill authorizes the Company to raise additional capital not exceeding £5392 1s. 8d. Power is given to borrow on mortgage an amount not exceeding £98,000. Various provisions are made for the internal administration of the Company. The limits of supply are extended beyond those of the three Companies to include the urban districts of Adwick-le-Street, Royston, and Hemsworth; the urban district of Darton, except part of the Township of Barugh, parts of the district of Hoylandswaine and Cudworth, parts of the rural districts of Doncaster and Hemsworth, and a number of parishes in the rural districts of Barnsley, Pontefract, and Penistone. The Company are to be empowered to purchase the undertaking of the Hemsworth, Grimethorpe, and District Gas Company, Ltd., but shall not supply gas within the urban district of Hemsworth and the parishes of Brierley and Shrafton until they have acquired this undertaking. Clauses are inserted for the protection of the West Riding County Council, the London and North-Eastern Railway, and the London, Midland, and Scottish Railway.

The calorific value of the gas is fixed at 475 B.Th.U., and the minimum pressure at 2 in. The basic price of gas in the main portion of the area is to be 12d. per therm, and in the differential area 15d. per therm. Provision is made for the revision of basic prices after the first five years. The basic rate of dividend is fixed at 6 p.ct. on ordinary stock and 7 p.ct. on preference stock. Charges for the hire of prepayment meters and fittings are not to exceed 2·4d. per therm if a cooking stove is included, and 2d. per therm if it is not included.

The Company are authorized to establish a profit-sharing scheme. The power of the Barnsley Gas Company to supply gas within the area of the Royston and Brodsworth Gas Company is repealed.

[*Parliamentary Agents: Messrs. Lewin, Gregory, Torr, Durnford, & Co.*]

Sheffield Gas Company.

This Bill is to enlarge and alter the powers and obligations of the Sheffield Gas Company with respect to the purchase and supply of coke oven gas, to extend the Company's limits of supply, to increase their borrowing powers, and for other purposes.

The Company's limits of supply for ordinary gas are extended to include those portions of the parishes of Catcliffe, Derwent Outseats, and Hathersage which have been added to the City of Sheffield, the parish of Wortley, and part of the parish of Tankersley. The basic price of gas in the added part of Wortley is fixed at 10d. per therm,

subject to revision under the Act of 1929. The Company are empowered to charge not more than 3d. per therm more in the added part of Wortley than the price charged within the main portion of the supply area.

The limits of supply for coke oven gas are defined to include the whole of the limits for ordinary gas supply; the remaining portions of the City of Sheffield, the County Borough of Rotherham, the Urban District of Stocksbridge, the rural districts of Wortley, Rotherham, and Chesterfield; the whole of the County Borough of Barnsley; the whole of the Urban Districts of Darfield, Darton, Greasborough, Hoyland, Nether Rawmarsh, Royston, Swinton, Wath-upon-Dearne, Wombwell, and Worsborough; the Parishes of Carlton, Adwick-upon-Dearne, Havercroft, Little Houghton, Dinnington, North and South Anston, Todwick, and Wales.

The Company may supply coke oven gas by agreement in bulk to any gas undertakers within the area of supply and to any authority, company, body, or person within the coke oven gas limits requiring a supply, subject to the consent of the gas undertakers of that area. The Company are under an obligation to supply coke oven gas of a specified calorific value and purity to gas undertakers within the area, on terms to be settled by agreement or arbitration. The Company are empowered to supply coke oven gas to gas undertakers in adjoining areas. Provision is made for meters and for the laying of mains and pipes in connection with the supply of coke oven gas. The use of coke oven gas for illumination is authorized subject to certain conditions. The Company are prohibited from supplying coke oven gas within the area of any other gas undertakers except with their consent.

A "Network Redemption Fund" is to be established by setting aside annually 4 p.ct. on the aggregate amount of capital expenditure incurred for the purpose of the coke oven gas network. The Company may provide capital, hold the securities, or guarantee the dividend or interest of any company producing coke oven gas. Separate accounts are to be kept of the coke oven gas business.

The Company's borrowing powers are to be increased by the substitution in the Act of 1929 of the sum of £1,129,000 for £580,000, and by the substitution of 65 p.ct. for one-third part. Provision is made for the issue of redeemable preference shares or stock and debenture stock. The Company are empowered to establish a renewal fund by appropriating annually an amount not exceeding 1 p.ct. of the aggregate capital expenditure exclusive of the network. The amount which may be carried forward to the credit of the net revenue account is subject to limitation. Clauses for the protection of the West Riding County Council, Rotherham Rural District Council, London, Midland, and Scottish Railway, and London and North-Eastern Railway are included.

[*Parliamentary Agents: Messrs. Rees & Freres.*]

South Yorkshire Gas Network.

The objects of this Bill are to incorporate and confer powers upon the South Yorkshire Gas Network Company, and for other purposes. The preamble states that a large number of coking plants are being worked in the West Riding of Yorkshire in conjunction with coal mines; that considerable quantities of gas produced by their operations are surplus to requirements and run to waste; that the quantity of coking plant gas available could be largely increased, if a market could be secured; and that with a view to the more economical and efficient working of coal and to the provision of cheap supplies of gas, it would be of public and local advantage that this surplus gas should be marketed.

The Company to be incorporated is for the purposes of purchasing and supplying coking plant gas, and any business incidental thereto. The capital is £500,000 in £1 shares. A part of the capital may be issued as preference shares. The amount of preference capital must not exceed the amount of paid-up ordinary capital. Dividends are limited to 10 p.ct. on ordinary capital and 7 p.ct. on preference capital. Borrowing powers are given up to one-half of the issued capital. The first issue of ordinary shares shall be not less than £40,000. One-half of the issue is to be offered to authorized gas undertakers within the limits of supply in proportion to their respective capitals. Local authorities and gas companies are authorized to purchase and hold the Company's shares. Interest not exceeding 6 p.ct. may be paid out of capital for five years after the passing of the Act.

Sub-section 2 of section 5 of the Mining Industry Act, 1926, is to apply to the capital, borrowings, and debentures of the Company as it would to a company formed for an amalgamation or absorption scheme under Part I. of that Act.

The powers of the Company for the supply of gas are limited to authorized distributors, and to companies, bodies, and persons requiring a supply for industrial purposes. Gas shall not be supplied within the area of authorized undertakers or distributors without their consent, subject to the Company's right to appeal to the Board of Trade against an unreasonable refusal of consent. Gas supplied for industrial purposes may be used for lighting on the same premises. Gas supplied must possess a distinctive and readily perceptible smell; and the Home Secretary may make safety regulations for the supply of gas.

The limits of supply are laid down in a schedule, and comprise approximately the area within a line running from Thurlstone through West Bretton, Ryhill, South Kirkby, and Brax, thence along the River Ouse to its junction with the Trent, and along the Southern Boundary of Yorkshire to Sheffield, and so back to Thurlstone.

[*Parliamentary Agents: Messrs. Dyson, Bell, & Co.*]

(*To be concluded.*)

REGISTER OF PATENTS

Dry Gas Meters.—No. 339,363.

ALDER & MACKAY, LTD., and ANDERSON, J., both of Edinburgh.

No. 21,394; July 11, 1929.

This invention consists in a method of fixing the diaphragms of dry gas meters according to which the flexible disc is gripped into a U-shaped ring by another U ring slightly smaller in size, so that the unit thus formed can be readily pressed into a diaphragm pan by finger pressure and easily removed without damaging the pan when new discs are required in the meter.

The diaphragm assembly is formed of six parts. Four parts are associated with and include the diaphragm itself, the other two parts are the fixing means. The first four parts consist of the diaphragm, two metal plates one on each side thereof, and a clamping means. The remaining two parts of the assembly consist of two circular rings. One ring is U-shaped in section, the other ring includes a U-shaped section of a slightly larger size than that of the first ring, so that the first ring can lie in it and the diaphragm be gripped between the two. This ring is beaded over internally in order not to injure the diaphragm, and externally is provided with a flange of suitable width to rest on the edge of the diaphragm pan or chamber.

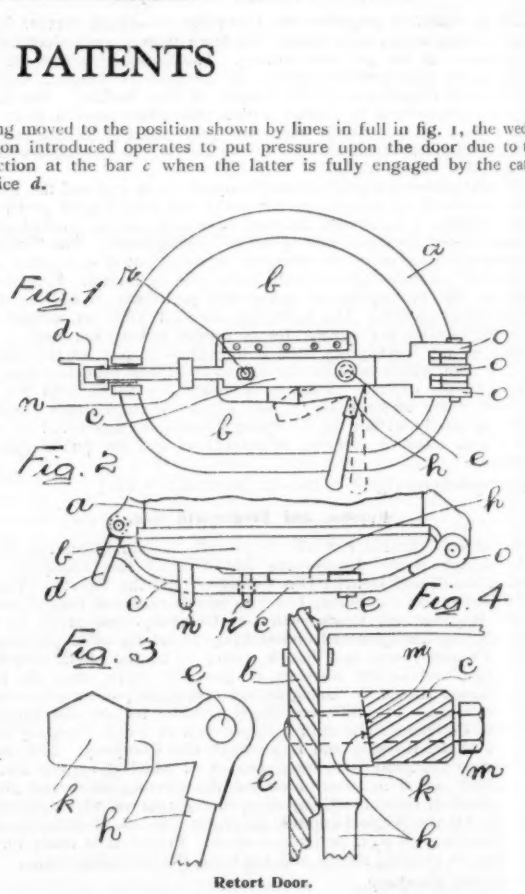
Retort Doors.—No. 339,557.

DEMPSTER, R. & J., LTD., of Manchester, and HOLT, C. E., of Wilmslow.

No. 5500; Feb. 19, 1930.

With reference to the accompanying drawings, fig. 1 is a front view of a form of retort mouth-piece with door thereon, and showing a cross-bar in position prior to being in full engagement with a catch device at one end. Fig. 2 is a plan view of a portion of fig. 1. Fig. 3 shows on an enlarged scale a lever device according to the invention, and in fig. 4 the lever is indicated at right-angles to the same in fig. 3, and is also shown in relation to parts involved in the process for which the lever is adapted. The end of the mouth-piece is indicated at *a*, and the door before the same at *b*. A cross-bar *c* hinged at one end is shown about to be fully engaged by a catch device *d*.

Pivoted on a spindle *e* is a lever *h* provided with an inclined flat face at *k*. This inclined face is adjacent to a similarly inclined flat face *m* formed on the inner part of the bar *c*. The opposite side of the lever *h* abuts against the door *b* (fig. 4). On the lever device being moved to the position shown by lines in full in fig. 1, the wedge action introduced operates to put pressure upon the door due to the reaction at the bar *c* when the latter is fully engaged by the catch device *d*.



Retort Door.

The handle of the lever device *h* is seen to be inclined towards the wedge-shaped part of the device. This results in the same tending to fall to the position shown by broken lines in fig. 1, and so, by gravity,

prevents tendency of the wedge part to lift somewhat into the engaging position by accident. Alternatively, it could be weighted for the purpose by some projecting part. As a falling tendency on the part of the bar *c* due to its own weight might similarly bring the upper portion of the lever device *h* into an operative position described, the bar is provided with a multi-leaf hinge, in the present case three, shown at *o*. The effect of this is to keep the bar very firmly in its horizontal position. With such an arrangement additional means which have already been proposed are rendered unnecessary.

The spindle *e* is assumed to be screwed into the door *b*, a nut *m* being provided for the screw-threaded opposite end of *e* for holding the same fast by tightening of the nut against bar *c*. *n* is the usual stop for limiting the outward movement of said bar, and *r* is a guide rod therefor projecting from the door into a slot in the bar *c*.

Expansion Joints for Retort Settings. No. 339,268.

SOUTH METROPOLITAN GAS COMPANY and SEACH, W. T., both of Old Kent Road, S.E. 15.

No. 26,804; Sept. 3, 1929.

In coke ovens and gas retort settings, state the patentees, it is usual to space apart the brickwork, thus providing gaps to allow the brickwork to expand on heating and contract on cooling. These cavities are liable to become blocked with dust and other foreign matter, reducing the available spaces so left for expansion, and which it is the object of this invention to prevent. Slots are formed in the opposite faces of each adjacent pair or piece of brick or other lining between which is arranged a gap or cavity to permit the expansion and contraction, the slots being situate adjacent to the front of the gap and provided with a strip or strips of metal or other suitable material to seal up the gap. When a plurality of strips are employed, pieces of mill-board or the like may be placed between the strips.

The strips are a sliding fit in the slots, and sufficient longitudinal play is allowed to permit of expansion of the bricks. In the case of thin walls or insulation brickwork a single strip of aluminium or other suitable metal about $2\frac{1}{2}$ in. wide and about $\frac{3}{64}$ in. thick is employed in a slot 3 in. wide. In thicker walls two such strips of metal are used with a thin strip of mill-board, about $\frac{3}{32}$ in. thick, between the former, the slot in this case being 3 in. wide and $\frac{3}{16}$ in. deep. The slot being half-an-inch wider than the strips of metal allows for a horizontal expansion of half-an-inch for each coke oven, retort setting, or furnace.

Non-Suicide Gas Ovens.—No. 339,639.

SMITH, H., of Manchester.

No. 23,322; July 30, 1929.

The patentee proposes to make the lighting of the burners of the oven dependent on first closing the oven door. He achieves this object by first turning on the main supply pipe, but interrupting it by a control tap, the valve of which is kept to its seat by a spring, and actuated by a block pushed back and kept back by a fair amount of pressure. The tap is screwed through the oven front along with the piston rod, which is made airtight by working in a packed gland, with the piston rod protruding half-an-inch or more through the oven front in such a position that the latch of the oven door catches it, presses it in, and keeps it in. In this way the gas is allowed to go to the burners until the oven door is released, when the gas to the burners is automatically shut off. A small by-pass flame is permanently alight, supplied from that portion of the supply which is not controlled, and in juxtaposition to each burner. For safety the oven door may be supplied with a peep-hole having an annealed glass or thin mica window.

Dry Gas Meters.—No. 339,829.

KIRKEWHITE ENGINEERING COMPANY, LTD., and GOLDSPINK, G. E., both of Nottingham.

No. 816; Jan. 9, 1930.

The patentees make the following claims for the invention:

1. In a gas meter, a flexible diaphragm; a rim to which it is secured formed with a circumferential groove in its exterior to admit the diaphragm and a binding wire; a diaphragm binding wire with hooks at its ends. A lever with two coaxial sleeves which are mounted on the extremities of the binding wire hooks, which latter form the sole pivots therefor. Helical cams surfaces on the inner ends of the sleeves, which are, when the lever is turned about the pivots, formed by the binding wire extremities, adapted to act on the bends of the hooks, draw the latter towards each other, thereby contracting the binding wire and tightly closing the diaphragm down into the groove in the rim.

2. In a gas meter, the combination of a diaphragm binding wire with hooked ends, a tensioning lever mounted on the extremities of the hooks, and a member which is **U** shape in section and is adapted to bridge the space between the two hooked ends of the binding wire.

3. In a gas meter, a diaphragm binding wire tensioning lever according to the preceding claim 1, made from a sheet metal blank stamped or bent into the required finished shape.

4. In a gas meter, a diaphragm binding wire tensioning lever according to claim 1, which is bent near its pivoted end so that it can not only be turned about the extremities of the wire on which it is pivoted through the maximum angular space, but will lie close to the side of the rim when the diaphragm is secured to the latter.

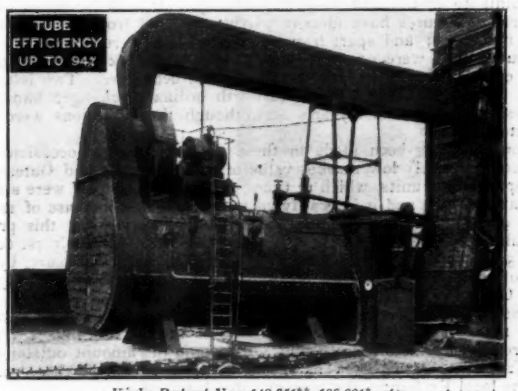
NOW STANDARD—

SPENCER-BONECOURT
PATENT WASTE HEAT
BOILERS

NO. 1. 1 TON STEAM FROM WASTE HEAT FOR EVERY 1¼ TONS OF COAL CARBONISED
is being obtained from waste heat alone with Spencer-Bonecourt Patent Waste Heat Boilers.

NO. 2. 5¼ lbs STEAM PER LB OF COKE
put into the producers is being obtained from waste gases at 700°C. with these Boilers.

NO 3. 4½ lbs STEAM PER LB OF COAL
put into the producers is being obtained from waste gases at 600°C. with these Boilers.



*Kirke Patent Nos. 140,851**, 186,801*, etc.*

NO. 4. 5 LARGE LANCASHIRE BOILERS FIRED WITH COKE & COKE BREEZE HAVE BEEN SHUT DOWN BY 2 SMALL SPENCER-BONECOURT PATENT WASTE HEAT BOILERS

NO. 5. No Economisers used in any of the above performances.

NO 6. WATER GAS PLANTS
have been fitted with these Boilers.

NO. 7. 14 REPEAT CONTRACTS
have been received from One Firm alone.

NO 8. HORIZONTAL, VERTICAL & INCLINED RETORTS, ALSO VERTICAL AND INCLINED CHAMBERS
have been fitted with these boilers.

NO. 9. £12,000 PER ANNUM RETURN ON £6,000 ORDER
is being obtained by one customer.

NO. 10. These Boilers have been installed in the Continents of
EUROPE, ASIA, AMERICA
AFRICA & AUSTRALIA

SPENCER-BONECOURT
LIMITED

THE WASTE HEAT RECOVERY SPECIALISTS
50-64, Broadway Buildings, Westminster, S.W.1
Telegraphic Address: "Bonecourt, Sowest, London." 'Phone: Victoria 2802-3.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Though business in most sections remained quiet last week, the Stock Exchange closed on Friday with somewhat higher hopes of an improvement in the near future. British Funds were dull for the most part of the week, but recovered towards the close, influenced doubtless by the coming repayment (on Jan. 15) of the balance of the 4 p.ct. tax free War Loan.

Gas stocks and shares followed the current trend of events in that the volume of business was on the quiet side, but prices of several issues showed good improvement. Imperial Continental ordinary gained 5 points to 340-360, and inquiries for Tottenham 5½ p.ct. preference caused a sharp rise in price of 4 points to 102-105. This stock, however, is not often obtainable, and only one transaction (at 96) was recorded during the whole of last year. Uxbridge, Maidenhead, and Wycombe ordinary and preference stocks both registered gains of 2 points to 97-102 and 90-95 respectively. It will be noticed that several debentures have already partly recovered from the recent *ex* div. markings; and apart from a further batch of reductions on this account, there were no decreases in value last week with the exception of a slight drop in Southampton 4 p.ct. debenture. Two issues—viz., North Middlesex and Wandsworth ordinary—changed hands at prices higher than last year's best, though the quotations were not affected.

Comment has been made in these notes on several occasions on the comparatively low market value of the Newcastle and Gateshead Company's £1 units, which at times during the past year were standing at 15s. 9d., and it is gratifying to note that an increase of 1s. to 17s. 9d.-18s. 3d. was recorded last week. The yield at this price, calculated on the dividend paid for the year 1929—viz., £5 7s. 6d.—is £5 19s. 5d. p.ct. It will be remembered that the Company, by its Act of 1929, is now working under basic price and dividend principles. The Company's 5 p.ct. redeemable debenture stock has been added to the Stock and Share List this week. This stock was issued in November, 1928, at 98 p.ct., and is redeemable at par on Nov. 1, 1943. Interest is payable on May 1 and Nov. 1, and the amount outstanding is £277,285. The quotations shown in the List will be those ruling at the local Exchange, the present value being 98-100.

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 12.

There is no change in the values of tar products, which remain as follows:

Pitch, 45s. per ton f.o.b.

Creosote, for export, 5⅜d. to 6d. per gallon f.o.b.

Pure toluole is about 2s. per gallon; pure benzole, about 1s. 8d. per gallon; 95/160 solvent naphtha, about 1s. 5d. per gallon; pyridine bases, about 3s. 9d. per gallon.

All prices for spirits are *ex* sellers' works.

Tar Products in the Provinces.

Jan. 12.

The average prices of gas-works products during the week were: Gas-works tar, 18s. 6d. to 22s. 6d. Pitch—East Coast, 43s. to 43s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 43s. to 43s. 6d. f.o.b.* Toluole, naked, North, 1s. 6¾d. to 1s. 7½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 2½d. to 1s. 3d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3⅜d. to 3⅝d.; low gravity, 1⅜d.; Scotland, 3⅜d. to 3⅝d. Heavy oils, in bulk, North 5⅜d. to 5⅝d. Carbolic acid, 60's, 1s. 2d. to 1s. 2½d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

*** All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.**

Tar Products in Scotland.

GLASGOW, *Jan.* 10.

Trading after the holidays has resumed on moderate lines; but stocks remain rather high and prices are easy accordingly.

Pitch.—Some export business has been placed, but prices are disappointing. Value remains nominal at 42s. 6d. to 45s. per ton f.o.b. Glasgow for export and about 42s. 6d. per ton *ex* works for home trade.

Refined tar to Ministry of Transport Specification is unchanged at 2⅝d. to 3d. per gallon f.o.r. makers' works in buyers' packages.

Creosote.—Business is scarce in ordinary grades; but virgin oils are steady as production is low. B.E.S.A. Specification is 2¾d. to 3d. per gallon; low gravity, 3⅛d. to 3⅜d. per gallon; and neutral oil, 3d. to 3⅛d. per gallon—all *ex* works in bulk.

Cresylic.—Few orders are being placed. Pale 97/99 p.ct., is 1s. 6d. to 1s. 7d. per gallon; dark, 97/99 p.ct., 1s. 5d. to 1s. 6d. per gallon; and pale 99/100 p.ct., 1s. 8d. to 1s. 9d. per gallon—all f.o.r. in buyers' packages.

Crude Naphtha.—Quotations are steady at 4d. to 4½d. per gallon f.o.r. in bulk.

Solvent Naphtha.—The demand is limited, and values are nominal. 90/160 is 1s. 2½d. to 1s. 3d. per gallon and 90/190 is 1s. to 1s. 0½d. per gallon.

Motor Benzole.—Stocks continue large, and the price is unchanged at 1s. 4d. per gallon f.o.r. works in bulk.

Pyridines are quiet with prices purely nominal. 90/160 is round 3s. to 3s. 3d. per gallon.

Benzole Prices.

The following are considered to be the market prices at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7½	to	0	8½	per gallon at works
Motor ,,	1	3	,,	1	4	,, ,, ,,
Pure ,,	1	7½	,,	1	8½	,, ,, ,,

Trade Notes.

Pickering Sand Quarries.

The extensive sand quarries at Pickering, formerly owned by the Pickering Sand Company, Ltd., have been acquired by Messrs. General Refractories, Ltd. of Sheffield. Excellent sand is produced at these quarries, and it is an established favourite in many foundries.

Gas Drying Plant for Chesterfield.

The Gas Committee of the Chesterfield Corporation have accepted the tender of Messrs. W. C. Holmes & Co., Ltd., for the installation of a naphthalene extraction and gas drying plant at the Municipal gas-works, and also the tender of the same firm for the necessary washing plant.

Diaries, Calendars, &c., Received.

Hazell, Watson, & Viney, Ltd., 52, Long Acre, London, W.C.

Manchester Paint and Varnish Company, Ltd., Ancoats Vale, Manchester.

Westwood & Wrights, Ltd., Round Oak, Brierley Hill.

Wimborne Minster Gas Company, Ltd.

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDER.

Pontardulais Gas Company (1930), Ltd.

To provide for the transfer to, and vesting in, the Company of the undertaking authorized by the Pontardulais Gas Order, 1906; to make further provision with regard to capital; to authorize the Company to use scheduled land for gas purposes; and to make regulations with regard to the supply of gas.

Legal Intelligence

South Metropolitan Employee Sentenced.

In connection with the deficiency of over £10,000 in the funds of the Metrogas Building Society (see "JOURNAL" for Dec. 17, p. 868), sentence of 15 months' imprisonment in the second division was passed at the Old Bailey on Dec. 17 on Leonard Thomas Rossiter (46), a clerk, who pleaded guilty to having embezzled three sums received by him on behalf of the Society. Mr. G. D. Roberts, prosecuting, said that Rossiter had been employed at a £500 per annum salary by the South Metropolitan Gas Company. He was the Assistant Secretary of the Building Society and received deposits from members. Over £2500 had been repaid.

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 9.	Rise or Fall on Week.	Transact'ns Lowest and Highest Prices Jan. 2 to 9.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 14	5	5	Aldershot 5 p.c. max. C.	73—78	..	..
522,992	,,	,,	4	4	Do. 4 p.c. Pref.	73—76	..	..
1,551,868	,,	Oct. 9	7⅜	7⅜	Alliance & Dublin Ord.	100—105	..	101—102½
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	70—75*	−2	..
522,655	,,	Aug. 28	7	7	Barnet Ord. 7 p.c.	108—111	..	..
800,000	1	Oct. 23	1/4⅛	1/7½	Bombay, Ltd.	15/6 17/6	..	16/—16/1½
174,500	10	Aug. 14	9	9	Bournemouth 5 p.c.	14½—15½	..	15½
800,050	10	,,	7	7	Do. B 7 p.c.	12½—13	..	12 7/16—12⅞
439,160	10	,,	6	6	Do. Pref. 6 p.c.	11—11½	..	..
50,000	Stk.	Dec. 18	8	8	Do. 8 p.c. Deb.	58—61	+1	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	76—79	+1	..
357,900	,,	Aug. 28	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	..	..
871,880	,,	,,	6½	6½	Do. 5 p.c. Con.	102—105	..	..
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	93—95a	..	..
855,000	,,	Sept. 25	8	7	British Ord.	108—113	..	112—112½
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	109—114	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	74—77	..	..
450 000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	95—98	..	..
100,000	,,	Jan. 8	5	5	Cambridge 5 p.c. Deb.	95—98*	−2	..
100,000	10	Dec. 4	10	6	Cape Town, Ltd.	8½—9½	..	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb.	70—75	..	..
626,860	,,	July 24	6	6	Cardiff Con. Ord.	95—98	..	..
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb.	97—100*	−2	100
157,150	,,	Aug. 14	6½	5	Chester 5 p.c. Ord.	86—91b	..	..
98,936	1	Oct. 9	†2/-	†2/-	Colombo, Ltd. Ord.	32/—34/-	..	33/3
24,500	1	,,	1/3⅛	1/4⅛	Do. 7 p.c. Pref.	18/—20/-	..	..
609,204	1	Oct. 9	1/9½	1/4½	Colonial Gas Assn. Ld. Ord	16/6—18/6	..	..
296,053	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	18/—20/-	..	..
2,078,280	Stk.	July 24	7	6	Commercial Ord.	95—98	..	97½
475,000	,,	Dec. 18	8	8	Do. 8 p.c. Deb.	57—60	..	..
787,560	,,	Aug. 14	7	7	Croydon sliding scale	106—109	..	107¼—108
453,100	,,	,,	5	5	Do. max. div.	83—86	..	85—85¼
542,270	,,	Aug. 14	10	7	Derby Con.	115—125e	..	..
55,000	,,	Dec. 18	4	4	Do. Deb.	65—70e	..	..
209,000	,,	Aug. 28	5	5	East Hull Ord. 5 p.c.	72—75	..	..
1,002,180	,,	Sept. 25	†7g	†4	European, Ltd.	95—105	..	97—100
18,628,125	,,	July 24	5⅜	5⅜	Gas Light & Coke 4 p.c. Ord.	19/6—20/-f	..	19/6—19/9
2,500,000	,,	,,	3½	3½	Do. 3½ p.c. max.	63½—65½	..	..
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	79—81	..	81—81½
5,502,620	,,	Dec. 18	3	3	Do. 3 p.c. Con. Deb.	60—63	..	61⅜—62½
3,542,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	99—102	..	..
161,480	,,	Sept. 11	10	10	Harrogate Cons. 10 p.c. max.	155—160	..	..
82,500	,,	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	..	..
268,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	79—84	..	..
70,000	10	Oct. 9	½	10	Hongkong & China, Ltd.	13—14	..	..
213,200	Stk.	Aug. 14	6	6	Hornsey Con. 3½ p.c.	88—91	..	..
2,436,594	,,	Nov. 6	25	15	Imperial Continental Cap.	340—360	+5	335—353
223,180	,,	Aug. 14	8½	8½	Do. 8½ p.c. Red. Deb.	80—85	..	..
235,242	,,	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord.	125—130	..	..
2,145,907	,,	Aug. 14	6	6	Liverpool 5 p.c. Ord.	96—97b	..	..
600,000	,,	Sept. 25	7	7	Do. 7 p.c. Red. Pref.	99—101b	..	..
165,736	,,	Aug. 28	8	9	Maidstone 5 p.c. Cap.	123—128	..	..
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb.	54—57	..	..
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean Metrop'itan (of Melbourne)	5½—5⅝	..	..
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	88—91	..	..
675,000	Stk.	Nov. 20	†8	†6	Montevideo, Ltd.	100—110	..	..
2,061,315	,,	July 24	5⅜	5	Newcastle & Gateshead Con.	17/9—18/3d/	+1/-	..
682,856	,,	,,	4	4	Do. 4 p.c. Pref.	73—74d	+1	..
691,705	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb.	66½—67½d*	−⅜	..
277,285	,,	Nov. 6	5	5	Do. 5 p.c. Red. Deb.	98—100d	..	..
169,940	,,	Aug. 28	7½	7½	North Middlesex 6 p.c. Con.	115—120	..	117—118
396,160	,,	Aug. 14	5	5	Northampton 5 p.c. max.	76—81	..	..
300,000	,,	Nov. 20	7	9	Oriental, Ltd.	104—109	..	..
60,000	5	13 My., '15	—	—	Ottoman	0—¼	..	..
205,162	Stk.	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	107 112	..	..
424,416	,,	Aug. 28	8	8	Portsm'th Con. Stk. 4 p.c. Std	115—120	..	..
241,446	,,	,,	5	5	Do. 5 p.c. max.	80—83	..	..
686,312	Stk.	July 24	4	4	Primitiva 4 p.c. Rd. Db. 1911	83—86	..	..
389,813	,,	Dec. 18	4	4	Do. 4 p.c. Cons. Deb.	83—86	..	..
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref.	8½—8¾	..	..
1,736 968	Stk.	Aug. 28	6¼	6¼	Sheffield Cons.	105—107e	..	..
95,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	76—78e*	..	..
90.000	10	June 5	†4	‡5	South African	4—6	..	..
6,709,895	Stk.	Aug. 14	7½	5	South Met. Ord.	104—108	..	104½—105½
1,185,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	112—115	..	114⅝
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb.	59—62*	−1	..
784,000	,,	Sept 11	6¼	6¼	Do. 6¼ p.c. Red. Db.	99—102	..	101¼
91.500	,,	Aug. 14	8½	8½	South Shields Con.	109—110d	+½	..
1,543,795	,,	July 24	6½	6½	South Suburban Ord. 5 p.c.	102—105	..	..
468,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	99—102	+1	100—101½
647.740	,,	Aug. 28	5	5	Southampton Ord. 5 p.c. max.	75—78	..	..
121.275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—78	−1	..
179,014	,,	July 24	8	8	Sutton Ord.	120—130	..	..
94,500	,,	Jan. 8	5	5	Do. 5 p.c. Deb.	94—97*	−2	..
250,000	,,	Aug. 28	7	7	Swansea 7 p.c. Red. Pref.	98—101	..	..
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	100—103	..	..
1,076,490	,,	July 24	6⅝	6⅝	Tottenham District Ord.	103 - 107	..	106
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	102—105	+4	..
199,005	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	76—79	..	77—78
182,380	10	30 Dec., '12	—	—	Tuscan, Ltd.	2—3	..	..
85,701	Stk.	Sept. 25	6	6	Do. 6 p.c. Red. Deb.	74—79	..	..
309,094	,,	Aug. 28	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	97—102	+2	..
38,330	,,	,,	5	5	Do. 5 p.c. pref.	90—95	+2	..
1,180,970	,,	July 10	—	7	Wandsworth, Wimbledon, and Epsom Cons.	109—114	..	113
200,000	,,	,,	5	5	Do. 5 p.c. Pref.	95—98	..	..
188,344	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	97—100	..	..

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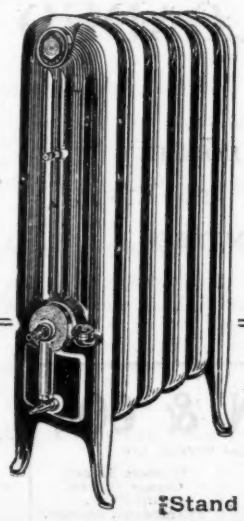

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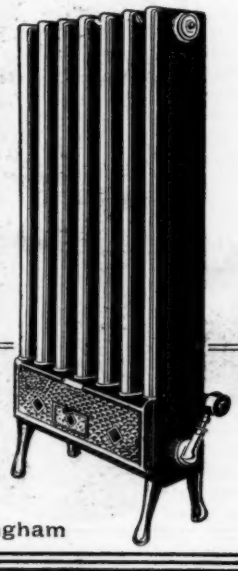

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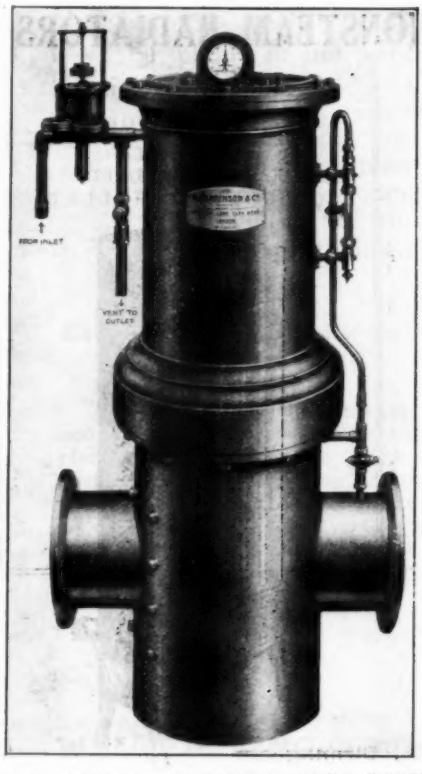

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